Interiors

Many people interested in photographing buildings are content to show them only from the outside, but there are equally interesting shots to be had by venturing inside. So what should you look for?

Photography is so often regarded as an outdoor activity, that many amateurs overlook the photogenic possibilities to be found indoors. Photographers tend to use interiors simply as locations for studio work and fail to notice all the subject matter that rooms themselves can provide. Yet the world has many rooms, old and new, grand and humble, large and small, and each may reveal just a little of the way people live or provide a scene as attractive as any landscape.

Too often photographers working on interiors become distracted by the technical problems, at the expense of creativity. Technical problems—such as lighting, long exposures, reciprocity failure and so on—are important and do need careful attention, but it is easy to become preoccupied with technique. Many photographers simply concentrate on lighting every corner of the room and ensuring that illumination is even—their pictures are frequently dull and lifeless. Although some shots may require skilful technique and elaborate lighting, strong and effective interiors can equally well be taken with a bare minimum of equipment and illumination.

Perhaps the best way to establish the appropriate treatment is to analyze the character of the room and pick out its most important features, such as any obvious architectural feature. Often the architect or designer of public buildings will have deliberately organized the room around a particular visual focus. There may be columns for instance, to lead the eye up to a vaulted ceiling and the room may only be seen at its best from one particular viewpoint.

But it can be something less tangible. It may be the way a domestic room reflects the personality of the occupant. In a stately home or palace, the most lasting impression is of opulence and elaborate decoration. Whatever the most important feature is, it can provide the clue to the approach. Concentrate on this feature and use the lighting and composition to show it to best effect.

If you can, it is better to establish the composition before you decide on the lighting. Unfortunately, it is often impossible to make a separate decision since the location of windows and lamps affect the composition in the layout of the room. In larger buildings, take advantage of any high viewpoints that are available. If you can climb up stairs or position yourself on an upper balcony you may find that you can get some unusual shots looking down.

Michael Freeman

Library of Congress *A combination of daylight and artificial light was used here, and a large format camera was used for maximum sharpness*

The major difficulty in composing an interior view is that it is not possible to reproduce the effect of actually being in the room yourself. In reality, although your eyes may focus on a relatively small area of interest, you are nevertheless aware of the entire surroundings, and so, in effect, experience the room on two levels. A photograph, however, can only show a limited area, even with a wide angle lens, so that important parts of the room may have to be left out of the shot. In a standard view, for example, there is no satisfactory way of including the ceiling.

The popular solution is to aim for as wide a coverage as possible, positioning the camera in a corner and fitting a wide angle lens with a field of at least 75°, that is, a 24 mm lens or shorter on a 35 mm camera, or 40 mm or shorter on a rollfilm model. In most situations this works well, but beware of reaching for your widest angle lens without thinking—wide coverage is not always the best solution, and there are occasions when the key feature of an interior can be better captured with a more moderate focal length. If not used with care, a wide angle lens often gives a cavernous

impression, which may not suit the mood of every interior.

A technical problem that is related to viewpoint and aggravated by a wide angle lens is the convergence of vertical lines. This is dealt with more fully in a subsequent article. Although this convergence is a perfectly normal feature of perspective, identical to the convergence of horizontal lines that you can see in a receding row of houses, it is less readily accepted by the eye when reproduced in a photograph.

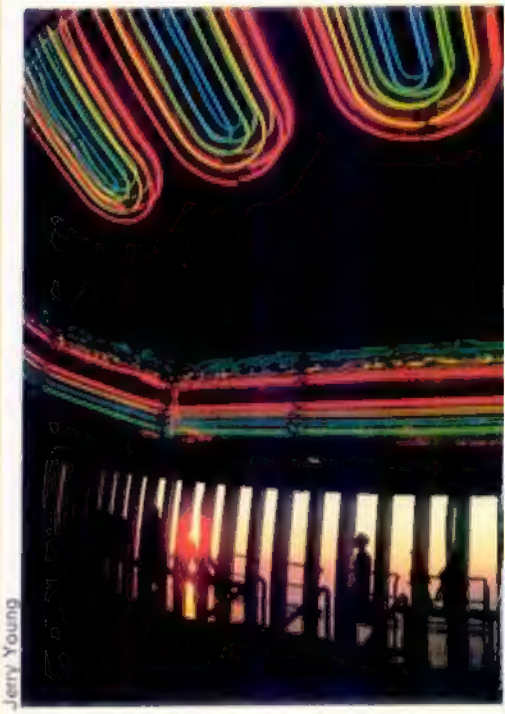
Although the problem of converging verticals is often over-emphasised at the expense of other, more aesthetic considerations, it is usually worth trying to solve. As a guiding principle, it is slight convergence that is the most objectionable, as it gives the impression, normally for good reasons, of being unintentional and a result of sloppy craftmanship. Strong deliberate convergence, achieved by tilting the camera upwards at a sharp angle, is by contrast, often successful, particularly with interiors that have rich ceiling detail. Interestingly, downward convergence, which you can see when photographing an interior from a high balcony, is generally acceptable—possibly because this viewpoint is sufficiently uncommon for us not to have preconceived ideas about the 'correctness' of the perspective.

The simplest solution, though, is effective composition—including foreground elements to balance the view and filling empty space at the bottom of the image. In domestic interiors you can move furniture around to suit the composition, but in public buildings, you must normally move the camera. With a wide angle lens, relatively slight changes in the camera position can have noticeable effects on the image, particularly with objects close to the lens.

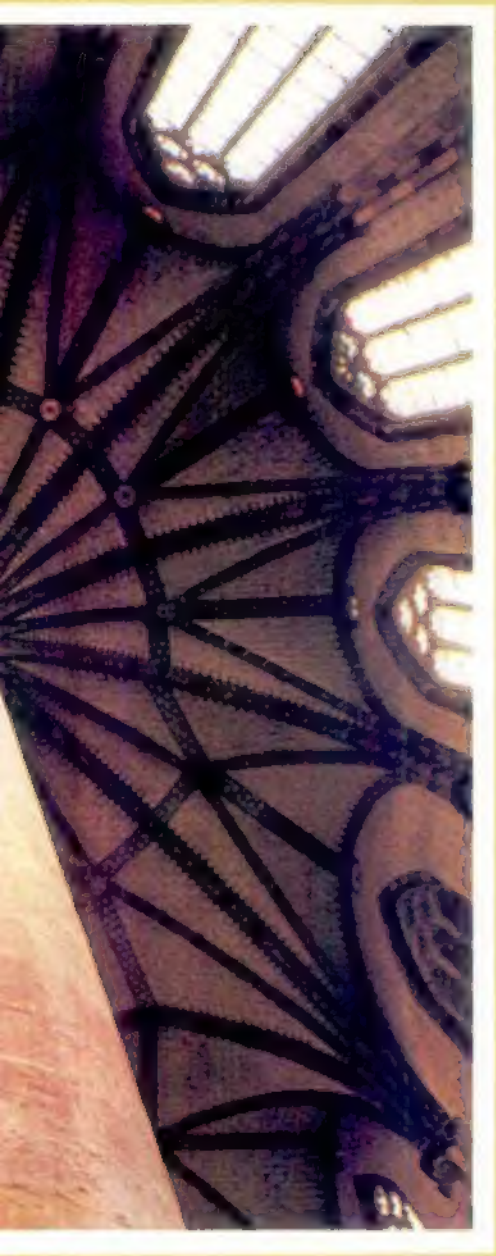
Staircase *An interior shot may be just as effective if only a small area is framed, such as this spiral staircase*

Stephen Green-Armytage/Image Bank

Edouard Berne/Topham/fotogram



Jerry Young



Looking up *Here the central pillar was used to improve the composition and to lead the eye to the ornate ceiling*

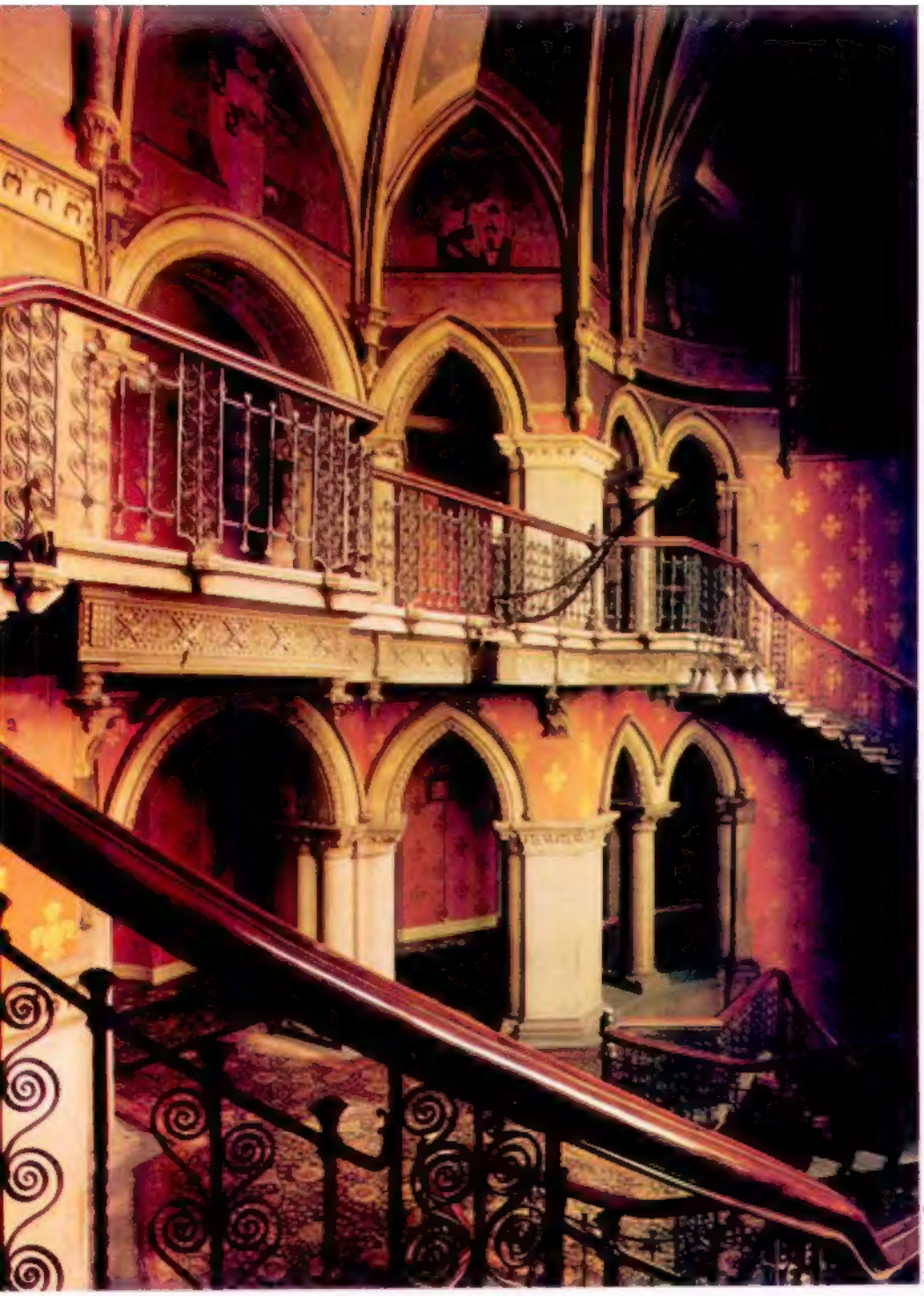
Steve Herr/Vision International

Neon lights *An ultra-wide lens was used to bring together a mixture of indoor and outdoor subjects and lighting*

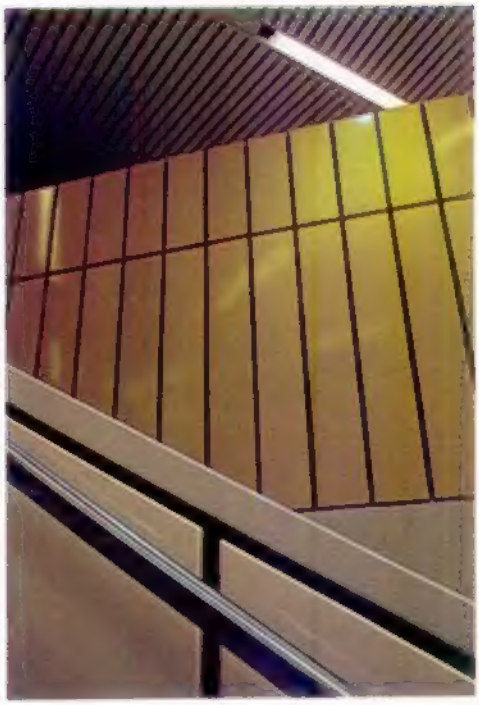
Paolo Koch/Vision International

Staircase *Details of interiors are a good way of showing the craftsmanship of a fine building*

Sherry winery *Careful framing has ensured that the arches recede into the distance in perfect symmetry*



Michael Freeman



Ian McKinnell

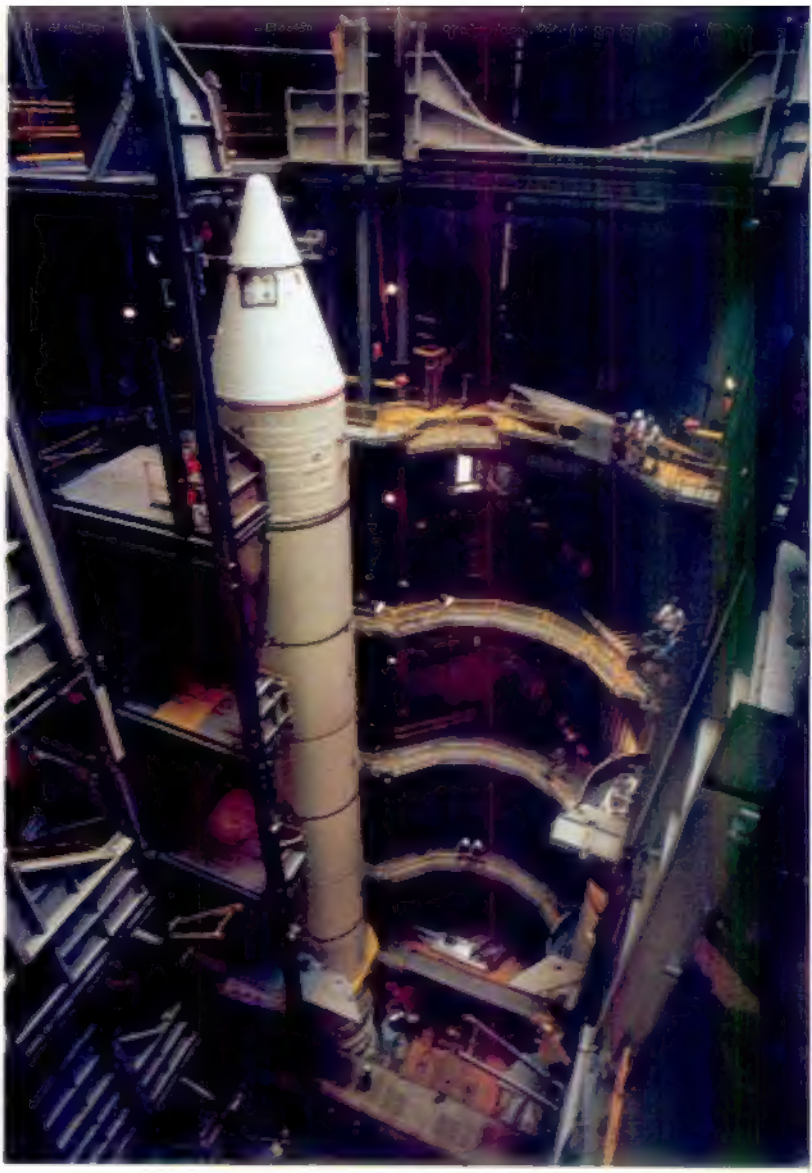
Michael Freeman

Balcony *The photographer stood half way up the stairs to avoid converging verticals and included the stair rail to balance the foreground with the rest of the scene.* **Bedroom** *A small tungsten light adds interest to the right side of the room.* **Staircase** *Modern interiors offer many striking details*

In fact, a wide angle lens has a number of other very useful properties. One of its most obvious benefits is a strong illusion of depth, created by the pronounced convergence of horizontal lines —sometimes called *linear perspective*— and by the exaggerated difference in

Michael Freeman

Indoor pool *Vapour lighting created an unusual colour cast but this suited the nature of the subject and added further interest to the pool*



Space shuttle booster *In the assembly hangar, light came only from overhead and 1 second exposure time was needed*

size between foreground and background. The value of this is that by including small objects in the foreground, such as a lamp or a book on a table, you can show an overall view of the room and give some idea of its contents in one shot. This treatment demands sharpness throughout the image, and although a wide angle lens has good depth of field, you still need a small aperture.

Sometimes, the format of the photograph—horizontal or vertical—suggests itself quite naturally, according to the nature of the interior and the viewpoint. If the proportions of the room favour height, such as in a cathedral or a Regency house, then a vertical frame is the obvious choice. But think carefully before using vertical format—it can be difficult to compose the foreground. A horizontal format is probably easier to frame, but inevitably misses anything close to or on the ceiling. Often it is hard to decide on the spot and it is worth taking a shot in each format.

Lighting is an integral part of the appearance of any interior, so before taking any decisions about supplementary lighting, look carefully at the normal room lighting, and pay special attention to the balance of different light sources. Most interiors receive at least some daylight, so that the time of day and weather conditions can make an important difference. On a bright day, an interior that has a large amount of window space will be so well lit that its own artificial lighting—table lamps, fluorescent lighting and others—would make no significant contribution. Towards evening, however, the balance between daylight and artificial sources swings in the opposite direction, and you should, if you have the time and opportunity, decide on the effect you prefer. Often, switching on a table lamp or wall fitting, even if it adds little to the overall illumination, may be an attractive way of lifting part of the room and giving a subtle alteration to the composition.

Remember, though, that the natural light shows the room as it is normally—and perhaps as it was designed to be seen. For example, the interiors of many cathedrals were designed to be aesthetically satisfying by natural light alone. Even more forcefully, the trompe l'oeil ceilings and murals found in many 17th and 18th century palaces show how good architects used lighting as part of the design. Indiscriminately adding your own lights can alter the character of an interior, not necessarily to good effect.

Nevertheless, if you do add your own lighting, you can put it to use in one of two ways: either to supplement the existing scheme, or to replace it. Supplementary lighting may be needed simply to translate onto film or a print the impression you receive by eye. If you measure the light levels in different parts of a room, you will probably find that the contrast range across the entire scene is high. Many interiors have windows along one wall only, so that by day there may be a difference of several *f*-stops from one side of the room to another. At night, most rooms, particularly domestic interiors, are lit by single, separate lamps, and in the photograph this gives an effect of pools of light and deep shadows. Because of the way the eye functions—scanning a scene rapidly and making fast adjustments to different light levels—this high contrast is not very noticeable in reality, but on film it appears exaggerated. For this reason, you may need to use lighting to fill in the shadow areas to even out balance. If so, any additional lighting should be unobtrusive, and the easiest way of achieving this is to diffuse the lamp with tracing paper or other translucent material: removing hard shadow edges disguises extra lighting.

An alternative method that you can use in a large interior with structural features such as columns or alcoves is to conceal lamps behind them, pointing away from the camera. This mimics an interior's artificial lighting, and, in large dimly lit interiors, may be the only satisfactory way. If the overall light level is low, it may be possible to leave the camera shutter open and walk yourself from pillar to pillar, standing behind each and firing a portable flash unit so that the room is lit adequately.

Improve your technique

Directing a model

Directing a model to give exactly the results you want is certainly not as easy as it seems. But there are a few guidelines you can follow to put your model at ease and help make picture sessions run smoothly

Many people have an image of the professional photographer working slickly through a session with a model, moving swiftly from pose to pose with just an occasional 'Hold it!' to break the flow. Few amateurs can work this easily with a model, though, and results from even the most informal session often look stiff and lifeless. There is no easy solution to this problem, but here are a few tricks of the trade to help improve your confidence and make it easier for the model to settle into the session.

It is usually easy to tell when a photographer has a rapport with a model, just by looking at the contact sheet or slides from the session. Poses are relaxed, and the pictures have a natural look to them. When the photographer has had difficulty with a session, this too is frequently obvious. The pictures look stilted, the model looks awkward and uncomfortable, and it is clear that there was very little communication between photographer and subject.

Perhaps the most important thing is to know before you begin the session exactly what type of pictures you want. Write down as much as you can about each photograph. Make a note of the kind of lighting you want to use, the location you have in mind, and the general atmosphere of the final image. With a clear idea of what you want, you can explain your plans to the model briefly and confidently. If you are unclear in your own mind, your directions to the model will be unclear too.

A relaxed pose *Inexperienced models are often given away by their hands. A simple prop gives them something to do*

Discuss with the model what sort of clothes are needed for the pictures—it is a good idea to have a change of clothes on hand if possible, to add variety. Think about hand props too, because these can give a nervous model confidence. Smokers particularly find it hard to know where to put their hands if they are not holding a cigarette. Holding an umbrella can give a model something to do, and take away the feeling of having 15 fingers.

Immediately before meeting your model to take the photographs, check that you have everything you need, and in the case of film, more than you need. This may sound obvious, but scrabbling in a gadget bag for a lens you left at home quickly breaks a model's concentration, and running out of film brings a session to an abrupt end.

Helping the model to relax

Professional models are expert at looking calm and comfortable in front of the camera, but for people who are unused to it, having a picture taken can be an ordeal. Do all you can to make your subject feel at ease. If you are working in a studio, whether it is purpose built or improvised, make sure it is warm and reasonably comfortable. Music is a great help, and fills any awkward silences while you are changing film or lights.

If your model seems nervous on arriving, do not be too eager to start taking pictures, and allow plenty of time to relax. Nude picture sessions present special problems, and these are covered in more detail on pages 177 to 181, and 370 to 372.

If you are working with an inexperienced model, it is sometimes a good idea to suggest that they bring a friend or relative along. This can give a much needed boost to their confidence: the friend might also help by holding reflectors, or touching up make up. Try and exclude all other people since it is difficult for anyone to look relaxed and natural if they are surrounded by a curious crowd. Professional models though, should be used to a busy studio.

Make as many preparations as you can before the session. Arrange the lighting as far as possible and take exposure meter readings from a stand-in in the model's position. Unless the lighting changes, you should be able to retain the same reading for the whole of the session. With adequate planning and preparation, you can concentrate on taking pictures without worrying about the technicalities.

Use a tripod *A hand-held camera can act as a barrier between the photographer and model. But if it is set on a tripod, you can concentrate on directing the model without having to spend lots of time framing up*

Sitting down *Pictures are more likely to be better if your model is comfortable. A seated pose is easier than standing*

Make-up *Remember to provide somewhere for the model to put on make-up. A proper theatrical mirror is not essential, but the area should be brightly lit*

Attention to detail *Take great care arranging clothes and hair. Small details that look insignificant at the time can easily spoil the picture*

Jake Wynter

Once you begin shooting, try and keep the model occupied all the time. A regular flow of conversation and encouragement helps a lot—everybody wants to be told that they are doing well, and you should try and provide this reassurance, even if you are not convinced that the pictures are any good. Work quickly, and do not try to economize on film. People tend to tense themselves just before the shutter is released, and then relax when they hear a click. A series of exposures in rapid succession is often better than a single frame, because the model does not have time to assume a fixed expression before each picture is taken. This is one reason why so many professional photographers shoot many rolls of film and use motor drives so they can work quickly.

Most models relax as a session progresses, so if things start badly, do not worry too much—they usually pick up momentum later. Often the best pictures from a session are the last dozen or so on the final roll of film, and the earlier shots are generally poor.

On the other hand, do not allow yourself to get carried away and push the model to the point of exhaustion. As soon as attention begins to flag, take a break and have a cup of coffee, or bring the session to an end. Working as a model can be very tiring, and it is easy to forget this, particularly if the session seems to be going well.

Using a tripod

Many photographers feel that clamping a camera to a tripod produces a rather rigid, inflexible type of picture. While this may be true for certain types of photography, a tripod can be a great asset when working with a model. It allows you to set the camera up at a fixed point, and take pictures without constantly squinting through the viewfinder. You can stand beside the camera, or just behind it, instead of bending down and hiding your face behind the lens. Using a long cable release and an autowinder allows you to get closer still. This makes it much easier to build up a relationship with a model, who can watch your reactions to a change in pose or expression. If you are unsure about the framing of the picture, mark the background with tape or string so that you can see where the edge of the viewfinder frame comes without having to look through the camera.

Shiny skin *Watch out for shiny skin highlights, on men as well as women. A touch of powder is all that is needed to eliminate a shiny nose*

Jake Wynter

Out of doors *Avoid static poses, such as standing the model on a patch of grass with nothing to do. Look for props, such as trees and walls*

Posing the model

Models who can provide an endless and varied stream of natural poses are rare, and even an experienced model needs to have some sort of direction from the photographer. If you have difficulty in knowing where to start, look out for examples of the type of pictures you are aiming for, and cut them out of magazines and newspapers. A scrapbook made up like this should not be slavishly followed, but makes a good starting point. You may be able to use your scrapbook to show the model the type of pictures you want to take on the session.

Do not forget that some poses are easier for a model to deal with than others. Standing up in an open space without anything to do can be demanding from a model's point of view, and seated or prone poses are much easier—on a chair or bench, the model generally produces far more lively poses and often has somewhere to put hands. Out of doors, look for anything that the model

can lean over, lean against or sit on. Benches, trees, walls and balustrades are all useful props. Inside, any piece of furniture can assist a model in finding an original pose.

Even if you start the session with well formed ideas about the poses you want your model to adopt, be pragmatic and try out any ideas that may emerge spontaneously in the course of the session. If any pose seems to be particularly successful, do not be impatient to move on, but stay with it, and work on small changes of position and expression, while retaining the same basic picture.

On the other hand, do not go to the other extreme, and keep the model locked into one position for hours on end. Keep some life and action in the pictures, even literally—if there is enough space, get the model to move around a bit. This is easily done if you are out of doors, because you can prefocus on a fixed point, and have the model walk towards you, or in circles around the camera. Avoid obvious cliches, though—subjects like 'jump for joy' have been done to death.

Indoors, avoiding static poses is more difficult, but you can get the model's hair or clothes moving with a fan or hair dryer or by waving a sheet of cardboard. If the model has long hair, a shake of the head does the job just as well. All these ploys put a bit of movement into an otherwise static picture.

Head and shoulders portraits can be more intimidating for a model than full length pictures, because the camera is so much nearer. Use a long lens if there is enough room to move back—even a 200 mm lens is not too long, but anything with a focal length over 100 mm is good enough. For headshots like this, a mirror placed alongside the model is useful, for a quick check on expression, hair and make up. Prop the mirror up so that the model can see the reflection without a turn of the head. A few fashion photographers use a posing mirror like this out of doors. Fixed to the top of a lighting stand, it is placed next to the model, just out of shot.

If any pose feels unnatural for the model, it is unlikely that it will look good on film, so, in general, use more relaxed postures in which the model feels comfortable and confident. If someone says 'Don't shoot from that side, my other side is better' or 'I never sit like this, I'll look silly', they are probably right, and you should try something else.

After the session

It is a matter of common politeness to show the pictures you shoot to the model, unless you are paying the full professional rate—which is considerable. If the model was unpaid, then a set of prints would probably be very welcome. If your pictures are good enough, you may be able to get a steady flow of willing sitters this way, because professional photographers charge high fees for producing a folio of prints for an aspiring model—this should be a fair reward for your model's time and effort.

There is no real secret to working successfully with a model, more than anything it is a question of experience. As you begin to photograph models more and more, your confidence will grow—the results should show in your gradually improving photographs.

Stepping out
Action gives life to pictures—ask the model to walk towards you, preset the focus and release the shutter as soon as the model is sharp

Simulated breeze
Wind-blown hair looks attractive in studio shots. Set the model's hair in motion with a piece of card, electric fan or hair dryer

Invisible light

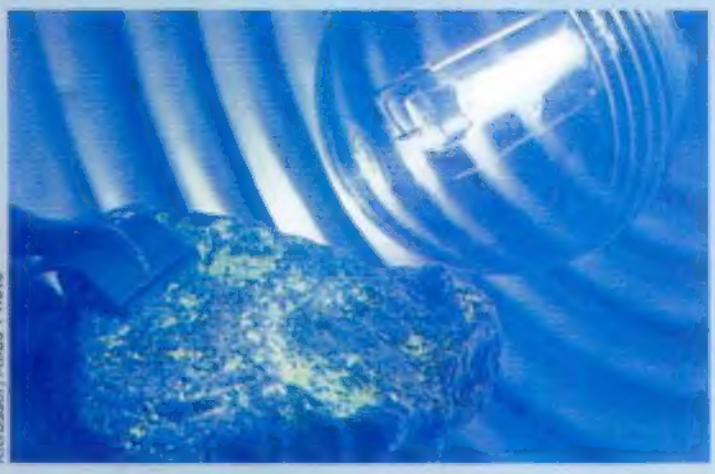
Infrared and ultraviolet light cannot be seen by the unaided human eye. But with special materials and equipment, photography can utilize these wavelengths

'Photography by invisible light' is a term often used to describe ultraviolet and infrared photography. Purists would scoff at the mixture of meanings — as by definition, light is visible—yet the term is not inappropriate. For it is quite possible to take perfect photographs in conditions which even the most sensitive eye would see as totally black.

Such photography is more than a trick—it is of great value in surveillance work, and in numerous scientific applications. In many cases special materials, equipment and techniques are needed, but even with an ordinary camera it is possible to take infrared pictures.

What we see as light forms just part of the *electromagnetic spectrum* (see page 198). It is the radiation with wavelengths between 400 nm and 700 nanometres (nm)—violet light and red light respectively. At other wavelengths shorter and longer than these values, the eye sees nothing. But radiation is still present, behaving in just the same way as visible light.

Radiation with a wavelength shorter than 400 nm, down to about 1 nm, is called *ultraviolet* (UV). Beyond the red end of the spectrum at 700 nm lies the *infrared* (IR), extending to wavelengths as long as 14,000 nm. Only part of the whole UV and IR ranges can be recorded by photography, however.



Kitrosser/Atlas Photo

UV fluorescence *Uranium ore, like some other substances, fluoresces in UV, and can be photographed normally*

Within limits, UV and IR can be focused by lenses, and affect film which is suitably sensitized. The other main requirements for photography by invisible light are sources of UV and IR radiation which are sufficiently bright, and, possibly, filters to limit the wavelengths used or lenses which will not absorb the radiation.

Materials

Photographic materials are naturally sensitive to UV, which means that they can be used without modifications, down to about 230 nm; beyond this gelatin in the emulsion starts to absorb UV. Then special materials with very little gelatin or with fluorescent coatings are used.

Infrared film has special dye sensitization (see page 534) to extend the normal limit of sensitivity from 700 to about 900 nm. Special materials can reach a maximum of about 1300 nm. Infrared film is noticeably grainy and needs to be kept cool to retain its sensitivity. A special film, Infrared Ektachrome, has an infrared sensitive layer, and by means of an unconventional arrangement of the image dyes in the other layers produces false colour effects. It has uses in aerial survey work.

Lenses and focusing

Because UV and IR have somewhat different wavelengths from visible light, they are refracted by conventional lenses to a slightly different extent, as the amount by which light is refracted depends on its wavelength (see page 271). Most lenses are *achromatic*, and are designed to bring all colours of visible light to virtually the same focus point. But UV and IR, being outside the normal range, have slightly different focus points.

Fortunately, most lenses have an infrared focusing index—usually a red line—on their focusing scale, to the shorter distance side of the normal mark, and the distance setting is transferred after visual focusing.

A special lens, called a *superachromat*, is corrected for the 400 to 1000 nm spectral region, and needs no refocusing even for infrared work. Aerial camera lenses are also infrared corrected. Mirrors do not disperse light as do refracting lenses, so a pure mirror lens, called a catoptric system, would need no focus corrections for UV or IR work. But all photographic mirror lenses also use some refracting elements as well (and are known as catadioptric lenses) and so still need some refocusing.

For UV work, the IR index mark may be usable—because of the way the lenses are designed. If it is not usable, a focusing correction for various distances must be established by trial and error.

Spectrum *Ultraviolet and infrared are regions of electromagnetic radiation either side of visible light*

Advertising Arts

Sources

Sunlight is a plentiful source of both UV and IR, though the proportion of either of these in sunlight is only small compared to the visible light output. The curve of the continuous spectrum on page 199 shows the relative proportions in sunlight of each wave length. Electronic flash has a similar UV proportion, while mercury vapour and fluorescent lights also emit UV. Incandescent (hot) lamps, such as photofloods and flash bulbs, are poor sources as most of their energy is given out in the visible and IR regions

Sources of infrared radiation include the sun, electronic flash, and all forms of incandescent source such as studio lights. All are useful, to varying degrees, for photography in infrared light

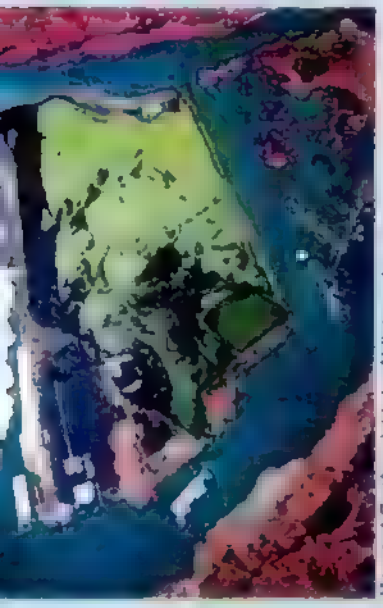
When no visible light is wanted, filters must be used which transmit only IR or UV Ultraviolet transmitting filters are made of a special type of glass—Wood's Glass—which is opaque. As ordinary glass absorbs UV below about 300 nm, lenses for UV use must also be made of a special material, such as fused silica (a form of quartz), calcium fluoride or fluorite, which transmit to 200 and 185 nm respectively Such lenses are very expensive—an example is the Zeiss UV Sonnar 105 nm f/4.3, which can also be used for visible light photography

Filters for infrared work—not to be confused with heat filters, which absorb IR—are fairly easy to obtain through normal dealers. A Wratten 87 filter is visually opaque but transmits IR, for example Such a filter may be used over the light source, for photography in the dark without alerting the subject In this case there is no need for a filter over the camera, unless there are light sources in the field of view which might otherwise drown out the infrared image. Alternatively, it can be used on the camera during daylight, so as to restrict the image to the infrared

Since such filters are opaque they do not allow an SLR viewfinder to be used. An alternative is therefore a Wratten 25, which passes some deep red light and allows reflex viewing

Use of UV and IR

Ultraviolet photography has various applications in forensic science and medicine, but the high cost of the special order lenses rules it out for most amateurs Infrared photography, however, needs relatively inexpensive films and filters



Howard Sochurek/John Hillelson Agency

Aerial IR *An oil slick records as green, while vegetation appears red*

White trees *Black and white infrared film is very grainy and has odd tonal effects*

As well as its uses at night for surveillance or wildlife photography, infrared is useful, for example, to penetrate haze that is visually opaque This is because the wavelength of visible light is of the same order of size as molecules and fine particles in the air, whereas infrared wavelengths are longer. In the same way, a tractor with large wheels can easily cross a ploughed field, whereas a car with wheels the same size as [illegible] soon get stuc[illegible]

Many photograp[illegible] use infrared fil[illegible] rendering of colours. In black and white, vegetation appears white while blue sky and water appears black. On false colour infrared [illegible] colours are repre[illegible] differently, with v[illegible] appearing red, for [illegible]

John Sims Vision International

[illegible] Menneer

Odd colour *The strange colour change with IR film can produce effects which are either bizarre—pink sky and green skin—or simply attractive, like the tulips*

World of photography

Alain le Garsmeur

Photojournalist Alain le Garsmeur has travelled the world from China to Nicaragua and taken thousands of pictures ranging from topical news stories to photoessays on the way people live

Alain le Garsmeur Camera Press Ltd

New York police *Alain once spent a week with police from a tough district of New York He saw unusual 'questioning' tactics and many other interesting confrontations*

Traffic hazards *The bold characters in this Chinese poster warn against the dangers of busy traffic and contribute to an amusing shot*

Californian railway station *Taken on assignment touring the United States by train*

Heat in Harlem *The ravages of arson in New York during the late 1970s produced some dramatic material*

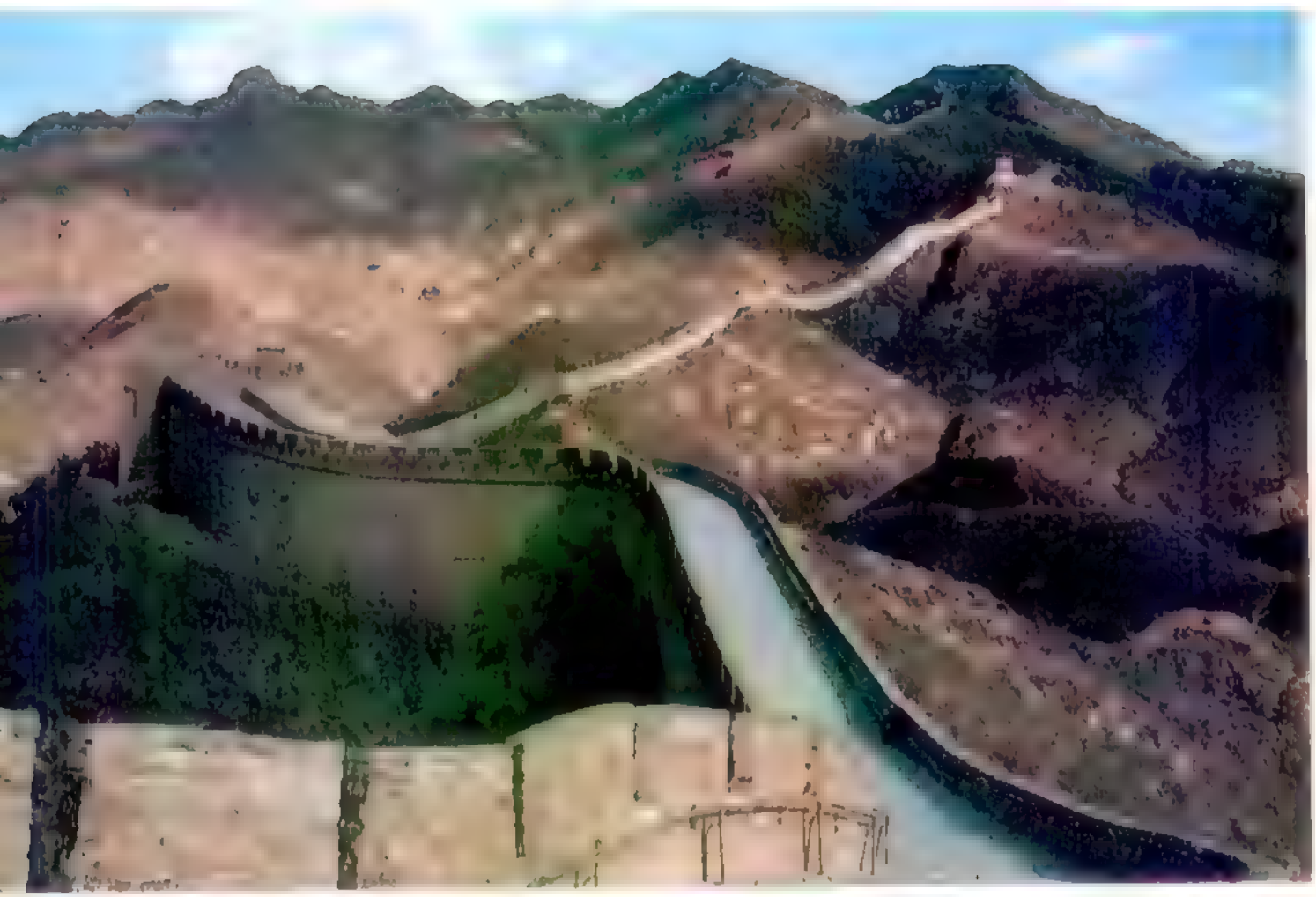
Peat digger *Alain found this peaceful image in the Irish countryside*

Russian newlyweds *This picture came out of a trip to Moscow. The couple were having their own impromptu wedding celebrations*

Candid comrades *These Chinese soldiers were being photographed by a comrade in Peking as well as by Alain*

Great Wall *On his Chinese tour Alain climbed to the top of a hill for this dramatic panorama of a famous site*

Riot police *Like soldiers from a bygone age—French riot police confronting anti-nuclear protestors*



Choosing instant cameras

Instant cameras can be fun to use and have a number of advantages over conventional equipment

From the button on an instant picture camera and a minute later you have a fully developed print. Any problems you encounter in getting the pictures right are easily dealt with because that an instant photography is quite unforgiving and easy. But you can show your subject the picture on the spot for an instant reaction.

A great advantage of instant picture cameras is that they are simple to operate. Even the more sophisticated models do not need exposure meters or any knowledge of normal camera controls. The majority are bought by amateurs who use them for snapshots, family pictures, shots at informal parties and as aids to the amateur hand in the home and sketch. Though more expensive and versatile models are available.

Portability and speed make instant photography very attractive to those people who do not want to bother with the formalities of more expensive equipment but it is also useful in serious amateur and professional use for test shots and visual references.

The disadvantage of instant photography is that with a few exceptions you can have only one print per shot. You cannot normally make multiple prints unless the subject is completely static and even then more than one shot. Should extra copies be required print copying services are available. But these involve a delay while having prints made from negatives at a slightly higher cost and lower quality.

Another disadvantage is that because the print is made in the camera rather than the equipment is bulky compared with the average pocket camera or the print size is rather small.

There is not a wide range of different film types available for use with each camera and the film types are not interchangeable between cameras. At most you will have a choice of either black and white or colour film packs designed for use with your camera.

Instant film systems were pioneered by Polaroid in the 1950s. The company has built its reputation on the quality of its imaging systems. But the company does not make all its material. The inventor of the original system was Dr Edwin H. Land, an American scientist and businessman, which gave Polaroid and Land CA Ltd the film system. Kodak entered the market with a film and camera with similar properties.

Instant picture frames

As each camera is designed to use a specific film it is important to understand the difference between the film types for systems. The peel-apart films produce dry prints and the more modern dry or self-developing film packs are manufactured by both Polaroid and Kodak for their own systems.

The peel-apart type involves pulling a tab once the picture has been taken. This squeezes the two layers of the film together with excess chemicals between them. After a set time—usually a minute—at room temperature the two layers are peeled apart to reveal the picture. The layer is left a negative and a second film pack that is kept and that is used with many cameras takes black and white film which yield a negative which can be used conveniently in an enlarger to make further prints.

Once the layers are peeled apart the print will dry. The protected print the surface must be exposed. When handling this type of film you must be very careful especially when fingers are pressed for thousands on the print and the disposable layer are not only [illegible] which is poisonous and may burn your skin.

The newer type of film is a single dry film pack in systems made by both Polaroid and Kodak. The chemicals are sealed within the print material, which is thicker than normal. As processing takes

Instant cameras *The range available includes (from left to right) a folding SLR, an autofocus camera, one with built-in flash, a simple Polaroid and a peel-apart-film type*

Simon de Courcy Wheeler/cameras courtesy of Kodak and Polaroid

Simon de Courcy Wheeler

Peel-apart film *Polaroid backs for medium format cameras and some older instant picture cameras use rather messy film that must be peeled apart*

[illegible] within this enclosed space and the chemicals are neutralized after development. The image then is no longer peel and is permanent. The design of this kind of film is much more complex but more reliable than peel-apart film. You do not have to time the development as you do with the older type of processing [illegible]. Furthermore, the film particular does not matter so much. However, the cost of this type of film is much greater. In both the Polaroid and Kodak systems, as soon as the picture has been taken, the print is ejected from the camera automatically. Within a few seconds the picture begins to appear and in a matter of minutes the colour print is fully developed.

The advantage of Polaroid dry film over the Kodak equivalent is that the batteries which power the motor and the eject mechanism are contained within the film packs themselves. As they will handle far more than the ten shots in each pack, there is no chance of running out of power. The Kodak system uses separate batteries in the camera.

There are important differences between instant film of either type and normal print film. Because the print is made directly, there is no way of adjusting for light exposure errors as can be made in normal film processing. Thus, if the film is exposed to the camera in light too dim or too bright, for a normal print, to compensate for poor exposure that film will not be satisfactory. The results [illegible] normal film [illegible] than normal film prints.

[illegible] of your own. Though some cameras do not use the [illegible] than comparable with normal slides or prints. The more-[illegible] are for good [illegible] by [illegible] and also for [illegible] under these conditions will be better than with normal film.

Exposing the film

Exposure with most instant cameras is [illegible] by a fixed [illegible] or a choice of two [illegible] represented by weather [illegible] [illegible]

[illegible] Polaroid [illegible] film [illegible] is [illegible] way of [illegible]

Pop out film *Some cameras have little motors that push out the film after you take the picture. The image then develops itself automatically and there is no negative to peel back*

Simon de Courcy Wheeler

Holiday snaps *Instant pictures are ideal for give-away snaps or pre testing composition*

David Robinson

Big films [illegible]

Focusing and framing

Bulk and accessories

Professional use

The choice

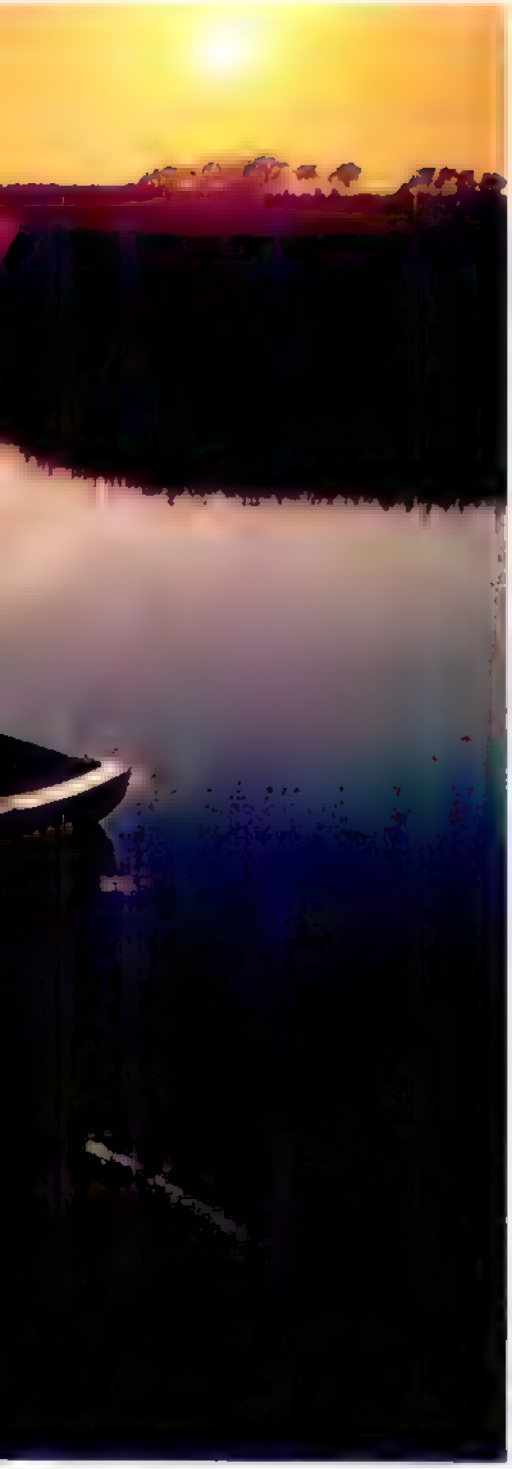
Comparison
Instant pictures are smaller and have less subtle colours than enlarged prints

Not compact
A 35 mm camera (left) looks tiny beside an instant camera

Assignment

Along the coast

Even the most spectacular coastline, if approached with thought and care, has much more to offer the photographer than shots of sea and sand



Trevor Wood

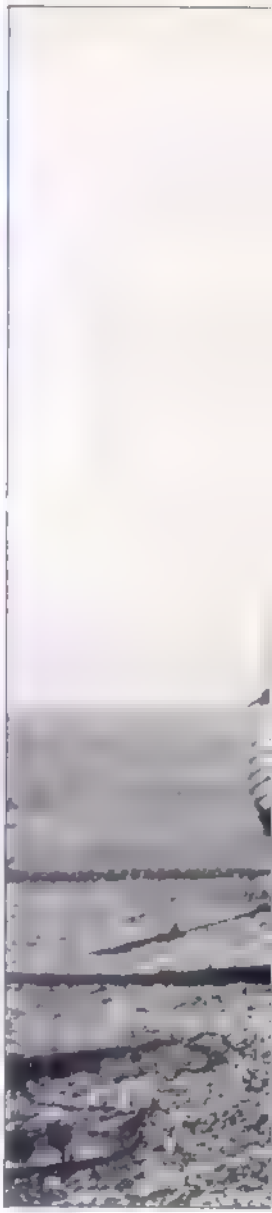
Estuary *Too often, sunsets make dull photographs, but for this shot Trevor exposed carefully for the boats to give foreground interest to the scene*

Tree and bunker *Here the withered tree and the derelict bunker contrast well with the sea, the bright blue sky and the fine wispy clouds*

Coastal view *In bright, clear dawn light a weak graduated neutral density filter brings out the colour in the morning sky*

Mushroom *This detail caught Trevor's attention. To get the best viewpoint, he lay down in the heather and used a 21 mm wide angle lens*

Bunker *Trevor also tried approaching the subject in a different way—this time leaving out the tree. Both versions resulted in attractive images*



[illegible] that knows exactly the [illegible] wants. For the black [illegible] absolutely necessary he did fit a graduated neutral [illegible] filter to add interest to the sky

Anglers *Here, the shot benefits from the action in the scene The early morning sky adds attractive colour and backlights the figure and his bending fishing rod*

Fishing boats *During an overcast spell in the afternoon Trevor loaded a roll of black and white in his camera. The low viewpoint emphasizes the shapes of the boats*

Weathered trees *To get a shot that showed the barren landscape, Trevor used a wide lens and framed the trees so their shapes showed up against the sky*

Erosion *Knowing that these cliff edges would soon collapse and disappear Trevor made this atmospheric study The low light level of early evening brought out texture in the ground*

Trevor Wood

Additive colour prints

If colour work and special techniques appeal to you—or if subtractive colour printing looks too complicated—then try additive printing

John Ward

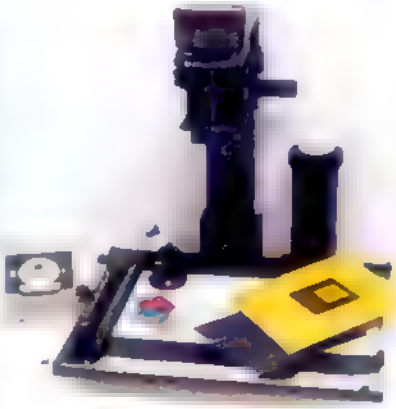
Additive colour *Full colour balance is obtained simply by varying the length of exposure through the three primary colour filters. Here the exposure combination needed was 6B + 10G + 20R*

Setting up

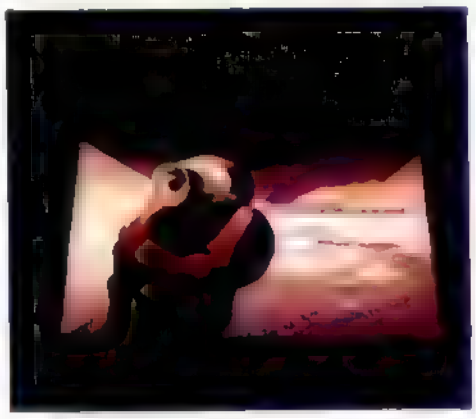
Additive principle *Like the Philips enlargers, this very sophisticated automatic model gives three simultaneous exposures through blue, green and red filters*

photo courtesy of Durst (Italy)

Evaluating colour prints

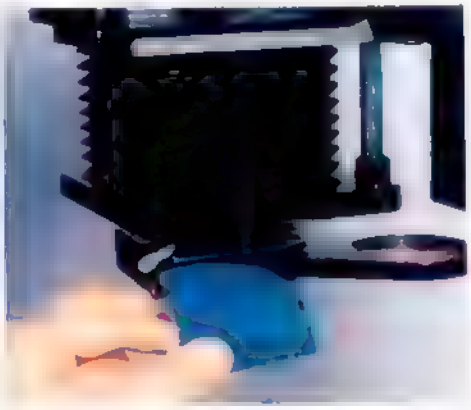


1 *For additive printing you need b & w printing equipment, some colour paper and one filter in each of the primary colours*

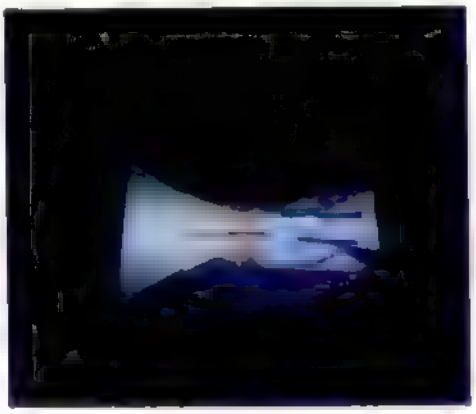


2 *Compose and focus the image as you would normally. A focusing aid ensures that your enlargements are always perfectly sharp*

3 *Stop the enlarger lens down to working aperture. For making test strips, however, you may find that a smaller aperture gives better control*



4 *Insert the blue filter into the filter tray of the enlarger, making sure that it fits snugly and covers the entire picture area*

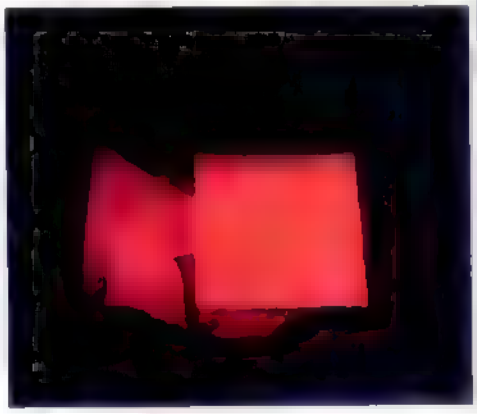


5 *You are now ready to make the first exposure. Expose the entire print for 10 seconds. You may have to adjust this for a second test print*

6 *Remove the blue filter and insert the green one. It is important to make sure that your filters are always perfectly clean*

7 *Expose the green test strip in steps of 10, 20 and 40 seconds, moving the mask vertically along the easel, to give a series of horizontal strips*

8 *Take out the green filter and insert the red one. The exposure steps for the red test strip are the same as for the green one*



9 *Make the final test exposure, moving the mask horizontally across the easel. Be careful not to jolt the enlarger between each printing stage*

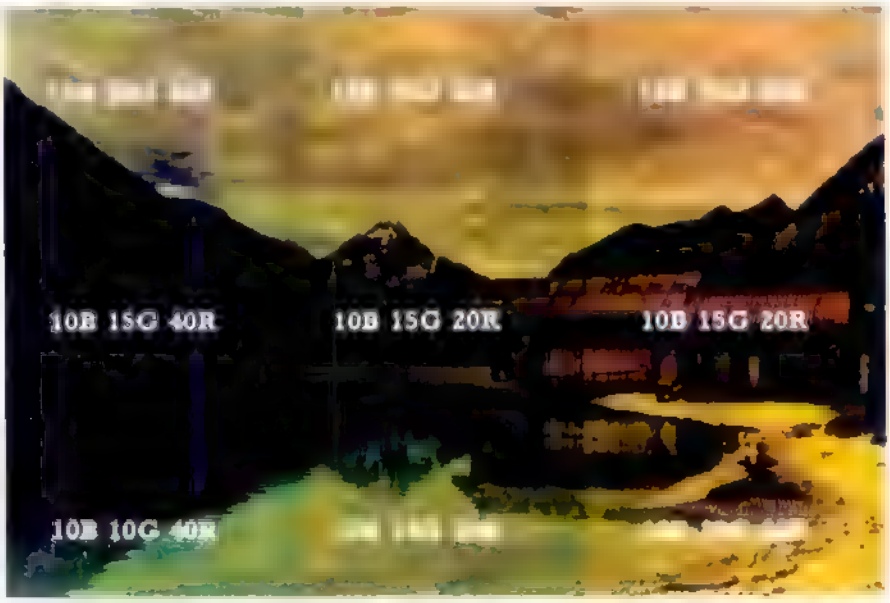
Jon Boucher

For these trial prints select a negative that is fairly typical of your work and includes a number of easily identifiable colours, ideally skin tones. Eventually you can build up a series of trial prints for a range of typical subjects which can act as a reference when making final prints from similar negatives.

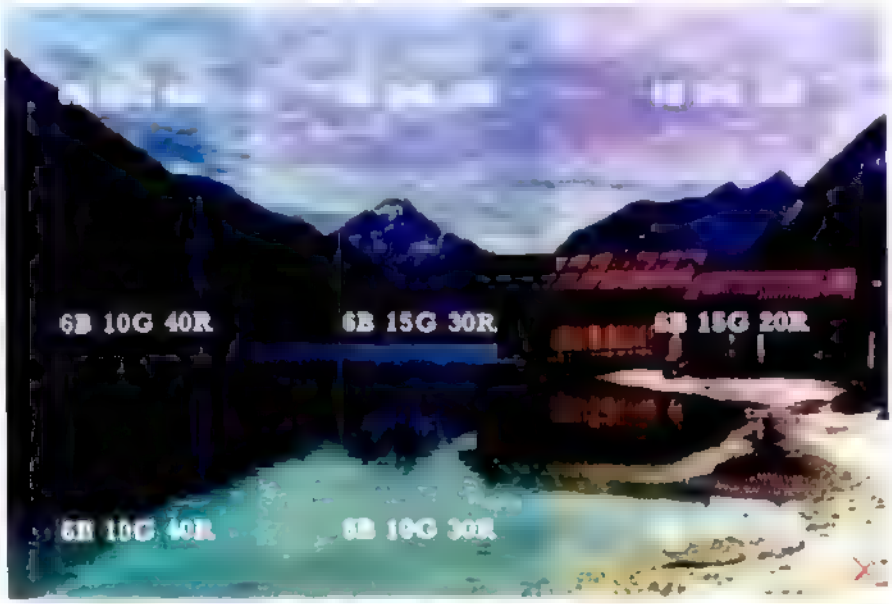
[illegible]

[illegible]

[illegible]



Evaluating your test print *After a few trial prints, your test prints should look like this. The grid of exposures above was obtained from 10 seconds blue plus up to 20 seconds green and up to 40 seconds red. The print is generally too yellow, and so a second test was made reducing the blue. This corrects the yellow, and shows correct exposure at the bottom (X)*



Weddings

Wedding photographs are frequently dull and formal and give only a hint of the full flavour of the event but with a little thought and careful planning, you should be able to take a series of attractive shots

Reception [illegible]

Look at the time! *This picture has all the elements of a good candid shot—you could quite easily set up something similar to give some of your photos a lighthearted touch*

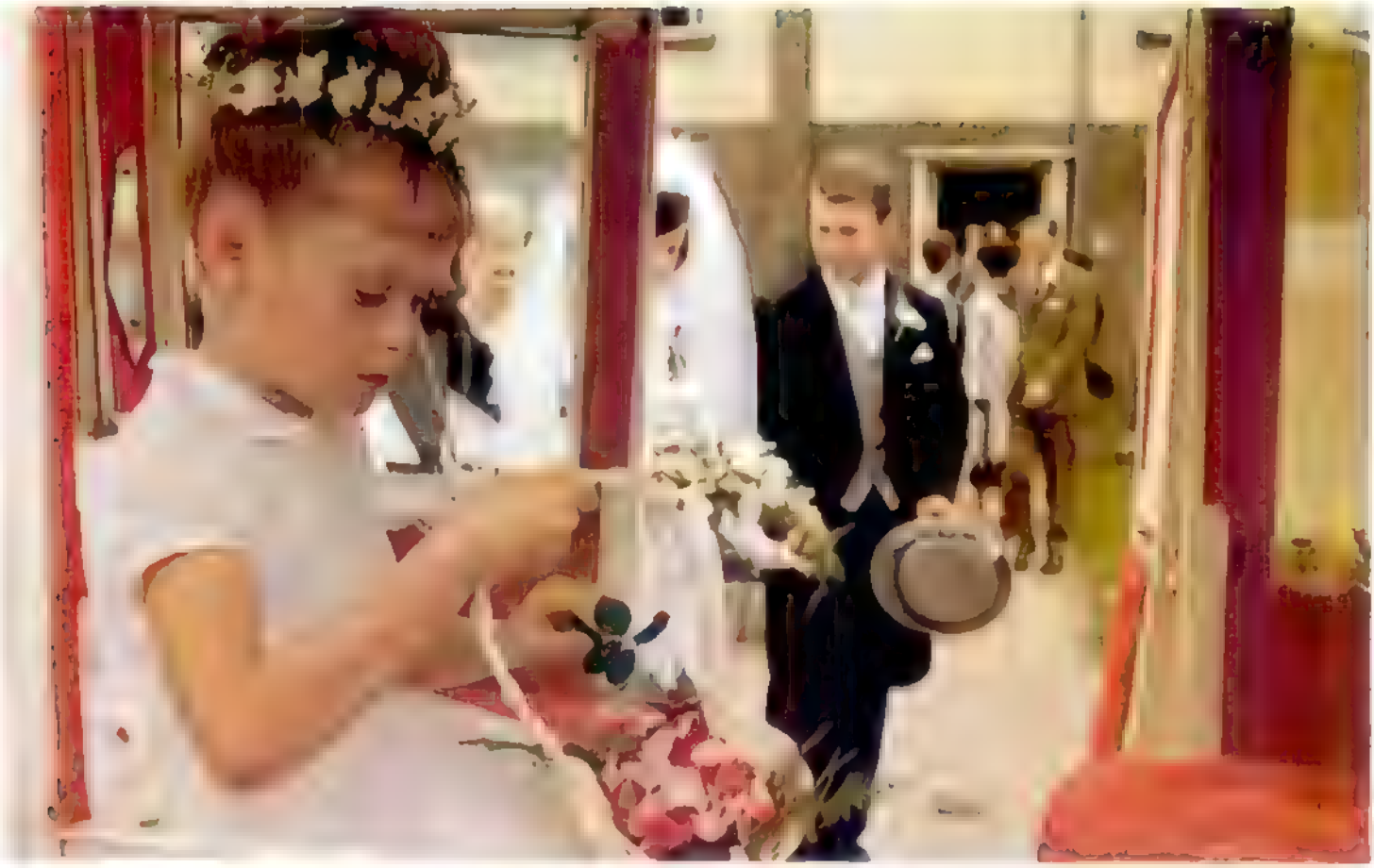
Signing the register *Many such shots are spoiled by cluttered backgrounds and bored singers. Move in close to fill the frame and try to provoke an amusing natural expression*

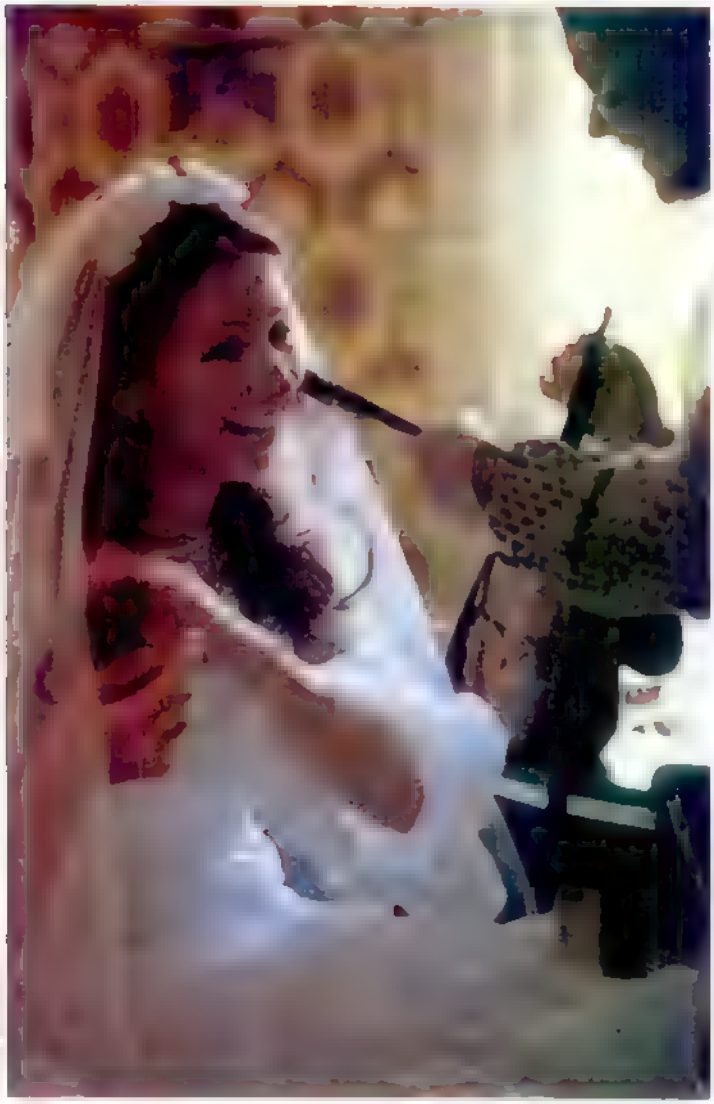
Look at that!
The best candid shots are taken while people are preoccupied

Formal group
For small group shots look for a pleasant back ground

Informal group
Everyone relaxes after the service—look for people laughing

George Wright





In the coach

[illegible] through the [illegible] in the [illegible] the [illegible] [illegible] shot

Bride at home

[illegible] to [illegible] [illegible] [illegible] you [illegible] unposed shots as the bride prepares

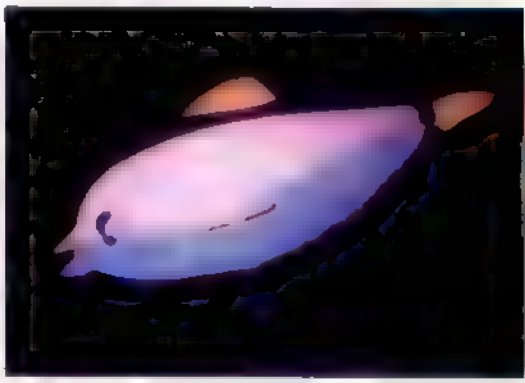
The church *From the back of the church you can photograph the service and the interior without disturbing anyone*

Head and shoulders *Close-ups are rare, but can be effective particularly if the bride has an attractive head dress*

Photograms

Photograms—simple shadowgraphs—could not be easier to make; you don't even need a camera. With a little imagination and a few basic darkroom techniques you can create attractive and unusual images

Tom Shepherd



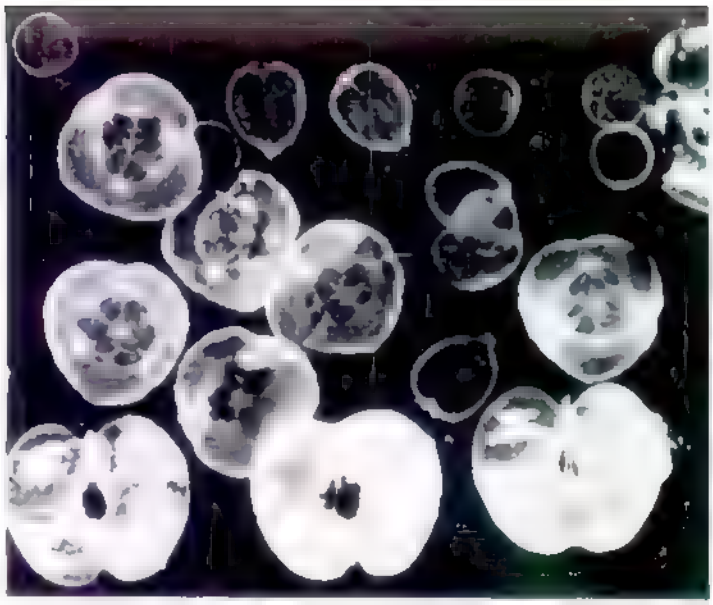
Tom Shepherd

Dolphin *A plastic toy was placed inside the enlarger to create this image*

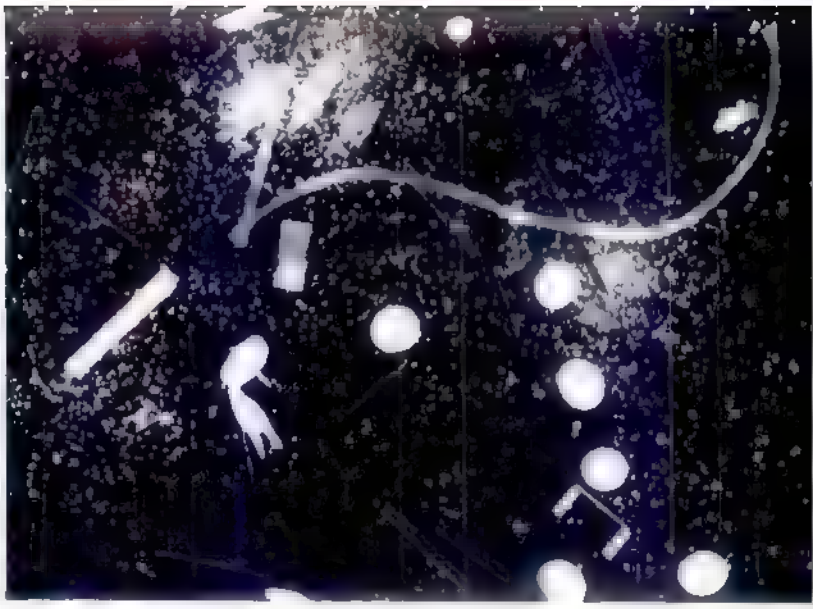
Grass *An image made by placing garden grass across the negative carrier*

The grey scale

Making a simple photogram



Slices of fruit *simply left on top of photographic paper*



Bits and pieces *The photogram was made by [illegible] that*

Ships *A drawing (below) was used as a paper negative and turned face down on to colour negative paper to create the photogram on the right*

Puzzled boy *By successive removal of the jigsaw pieces, different areas of the paper were exposed to light. Between exposures the easel was rotated*

Using a mask

Using the negative carrier

Making a colour photogram

Filtration with colour negative materials

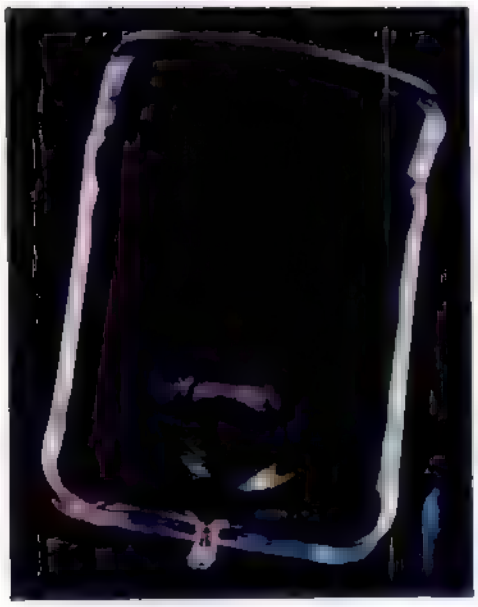
More blue—add yellow

More red—add cyan, or reduce magenta or yellow

Neutral	65	40	00
Bright blue:	120	40	00
Bright red	45	[illegible]	00
Bright green	75	00	00
Bright yellow	45	40	00
Bright magenta	75	00	00
Bright cyan:	100	65	00

Chairs [illegible]

Making paper negatives



Boxes in the enlarger *By using polarizing filters, one above and one*

below the clear plastic boxes, spectrum colours appear in their images

The way we see

Photography and human vision are often compared—indeed, they share some common features—but there are fundamental differences between them which give each a unique view of the world around us

is often compared
camera Indeed, at a
on features But it is
to push the compari-
differences
important than the

similarity be-
the camera
both use a lens
image on a
Our
scene is, in fact
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of the
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ght sensitive layers
ted to the brain by
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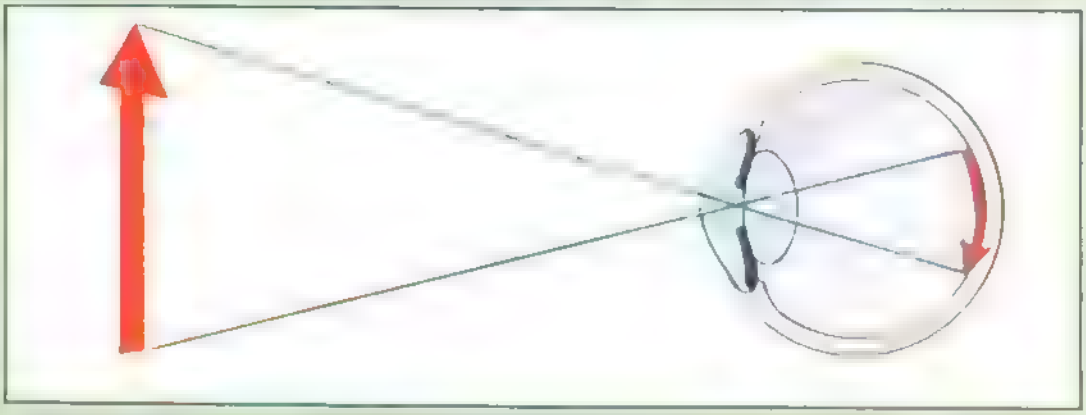
aic of receptor cells
n image is formed on the retina by a lens system Light
ye is refrac-
cornea, passes through a clear liquid known as *aqueous humour*, through an aperture called the *p*
and then is refracted more



Advertising Arts

the *crystalline lens* The function of this lens is simply to alter the lens system in order to focus on objects at different distances This process is known as *accommodation*, and is achieved by a muscle, called the *ciliary muscle* which alters the focal length of the lens It does this by changing the shape of the lens—a major difference between human and photographic systems After leaving the lens system, the light passes through more transparent liquid, known as *vitreous humour*, to the retina where it is picked up by the receptor cells

There are two basic types of receptor cell *Cone cells* which respond to normal and high illumination levels are responsible for colour vision and are concentrated mainly towards the centre of the retina At the centre in the region known as the *fovea*, there are only densely packed cones This area is responsible for the sharp vision which exists at the centre of the visual field

Rod cells are sensitive to low light They produce no colour sensation whatever and are more dispersed, being situated mostly towards the edge of the retina This is why in low light, when only the rods are working, vision is much less sharp than under normal conditions

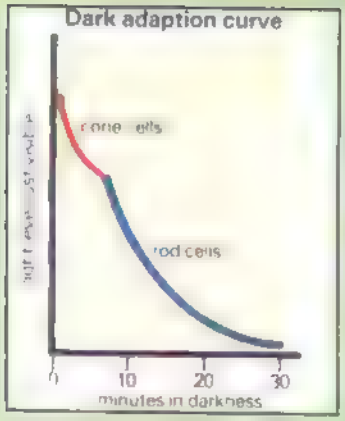
The uneven distribution of the cells means that the image deteriorates towards the edges, where the cells are less dense The entire field of view of human eyes is very wide—up to 180 horizontally —but the edges of vision are useful only for the perception of movement

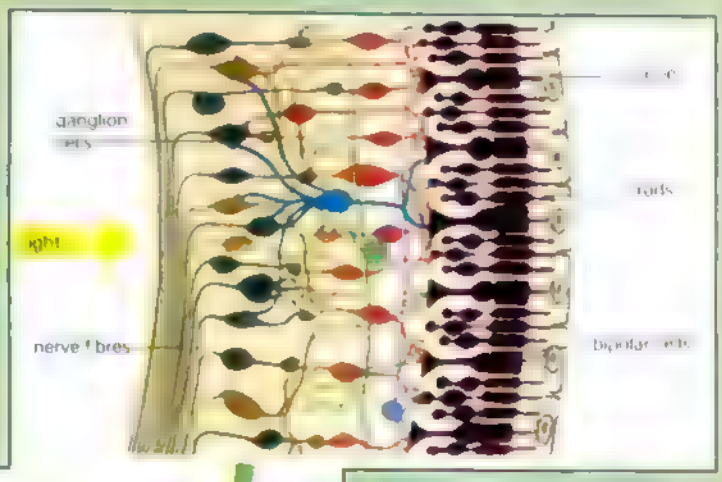
In a camera, however, the resolution is nearly the same over the whole image area With human vision, in order to build up a detailed picture

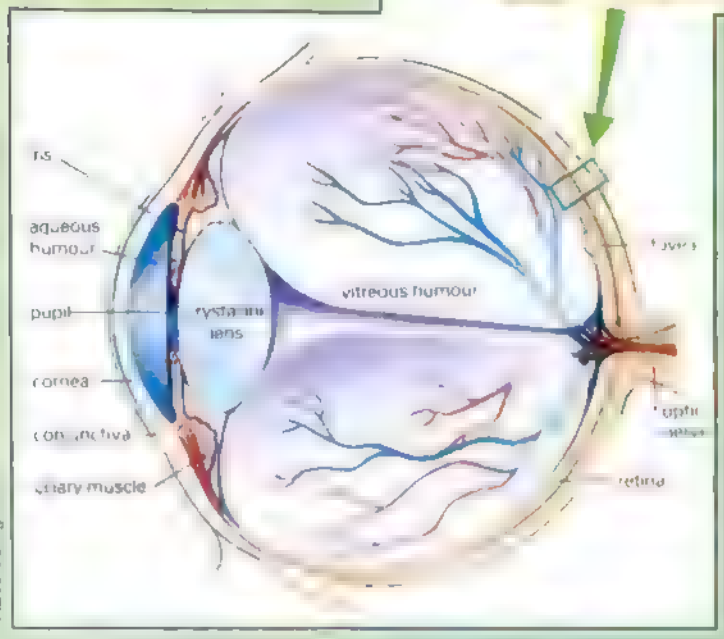
Inverted image *The lens system of the eye forms an upside down image of the subject on the retina*

Martin Dohrn S

Bright light *The pupil narrows to reduce the light entering the eye*







The human eye *There are many differences between the eye's image system and that of the camera. One of the most interesting aspects is the way in which light must first travel through various tissues and blood vessels before reaching the actual light sensitive surface underneath, so reducing the light reaching the cells*

of the whole scene, the eyes and head are moved in a scanning motion. In this way, all parts of the scene are viewed separately by the sharp central region of the eye—the fovea.

Although the image is upside down, this does not create any problems. The brain corrects information coming from the eyes so that the world is not seen inverted.

Human vision is capable of making a number of allowances for various conditions. One of the most important of these is *dark adaptation*. The use of different cells, combined with variation in the size of the pupil, allows the eye to adapt to a range of light levels. The *iris*, the coloured part of the eye, changes so that the width of the pupil increases in low light and decreases in bright light—in a similar way to a lens aperture.

The adaptation process may take some time if the brightness difference is quite large, for there is another mechanism at work—the release of a chemical called *visual purple*, which gives the retina further sensitivity. Eyes which have become used to the low light in a darkroom—which have become dark adapted—are dazzled when suddenly confronted with daylight. When going into the dark, adaptation may take as long as half an hour.

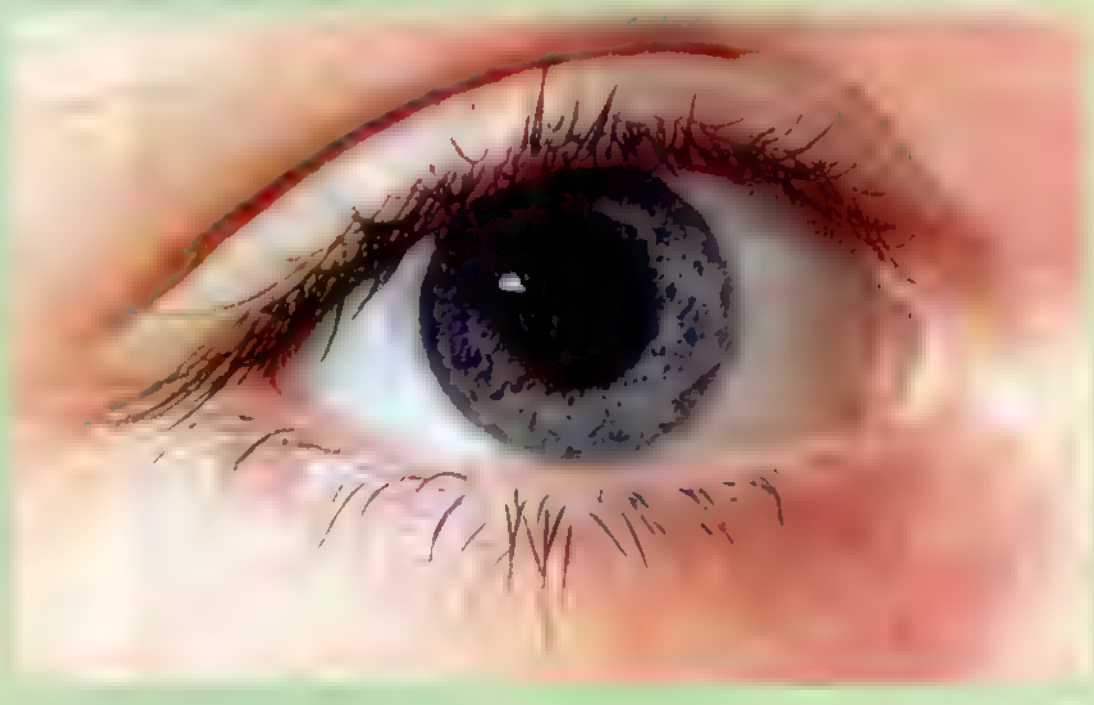
To enable the eye to adapt to the lower luminance of a camera focusing screen, therefore, it is helpful to exclude all extra light. By using an eyepiece cup, collapsible hood or focusing cloth, the screen actually seems brighter.

A film has no powers of adaptation. When photographing a scene, the exposure is usually a compromise between the various tones. Details in shadow or highlight areas may be lost. The eye, however, moves from one area to another, adapting for each different light level within limits.

One advantage photography has over human vision is that light has a cumulative effect on film. In very low light, an image can be built up over several hours. The limiting factor is reciprocity failure (see page 466). With the eye a certain minimum amount of light must fall on the cells within a specific time period (about one tenth of a second). If a sufficient quantity of light does not arrive within this time no image will be per[illegible]

Most cameras are confined to a single view and a two dimensional result. Human vision however is not just one view but two. The images received by the brain are combined and related to the angles of view of the eyes (like a range finder—see page 614) to give a sense of depth. This is *stereoscopic vision* and enables us to judge near distances with great accuracy.

It can be seen that human and photographic systems use different views of the subject and e[illegible] different methods of [illegible]ording it. There are many [illegible] ences, particular[illegible]ard to colour (which [illegible]lt with in a subsequent [illegible]ter). In fact the dissimilarity [illegible] the way we see and th[illegible] the camera records [illegible] the features w[illegible] photogr[illegible]



Low light *The pupil widens to admit more light, like the aperture of a lens*

Advertising Arts

Martin Dohrn Science Photo Lib[illegible]

Anthony Crickmay

Internationally renowned as a dance photographer and, more recently, for his fashion photography, Anthony Crickmay is at the top of his profession. He is famous for his ability to capture movement and grace

Caught in motion *This whirling dancer was caught during a performance of Daphnis and Chloe by the Royal Ballet*

Anthony Crickmay, Bassett Ryan Bell

The dying swan *Maya [illegible] of the Bolshoi Ballet takes flight in a special photo call for Swan Lake*

Rudolph Nureyev *Taken at [illegible]'s studio to publicize the London Festival Ballet's production of Scheherazade*

Dancers in flight *Kate Harrison and Linda Sitters during a performance of Robert Cohan's class in 1975*

The sinuous figure *of Siobhan Davies. A publicity shot for a performance of Harmonica Breakdown at London*

Surrender *Kate Harrison posing in the studio for the publicity for the London Contemporary Dance Theatre's Fixed*

A superb leap *photographed during the London Contemporary Dance Theatre's production of Cloven Kingdom*

Anthony [illegible] photographer, Opera Theatre

Night of the Waning Moon *Sally Owen and Thomas Yang in a production by the Ballet Rambert in London*

Le Corsaire *Peter Schaltbass caught in mid air in a picture taken at the studio for the London Festival Ballet*

On stage *A line-up of some of the principal performers in the Ballet Rambert's production of The Tempest*

Simple close-ups

Using close-up equipment to move in and focus on a detail can often result in as interesting a photograph as a shot of the whole object

Butterfly [illegible]

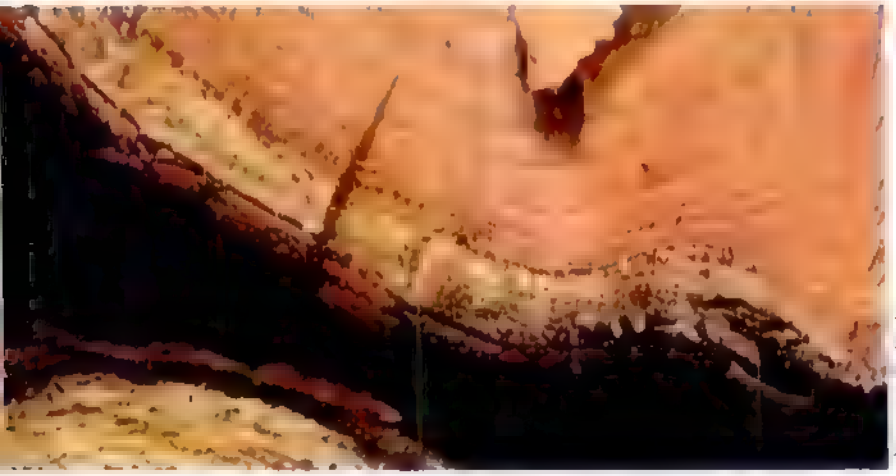
Close-up equipment

Supplementary lenses

Focusing for close-up *At short range it is easiest to focus by moving back and forth until the subject appears sharp in the viewfinder*

Using extension tubes

Fitting a ring *Attaching an extension ring is no more difficult than changing a lens. Bayonet mounts couple the ring to the camera body and lens and take just a few seconds to fit*



Common or garden close-up *The beauty of macro photography is that it enables you to see ordinary objects in a new light. Photographed from a few centimetres away, even the most mundane objects become almost unrecognizable and can take on an interesting abstract quality. Look especially for subjects like these where all the important detail lies in a flat plane – depth of field is very limited at high magnifications.*

Movement and depth of field

focus. This makes a

Exposure compensation

All exposure meters which do not read through the lens are calibrated on the [illegible] that the camera lens is focused on infinity. At closer subject distances, the lens is moved farther away from the film, and the light passing through the lens is spread over a wider area, so it is dimmer. This fall-off in illumination obeys the inverse square law (see page 254) so doubling the lens extension cuts the brightness to only a quarter.

Whenever the film-to-lens distance is increased to take a close-up picture, you must allow extra exposure to take this into account. Since close-up lenses focus closer without moving the lens farther out from the film, they need no compensation, but all other close-up systems do.

The necessary correction is affected not only by the lens extension, but the also by the focal length. To work out the correction, divide the total lens extension by the focal length, and square the result.

If you are not mathematical and use a 35 mm camera, you may find the chart below helpful. Set up your close-up picture, then place the chart in the subject position. Line up the right hand side of the panel with the right hand short side of the viewfinder frame, and you can then read off the compensation on the left hand side, either in the form of the number of *f*-stops by which the lens aperture should be opened or an exposure factor, by which the exposure time should be multiplied.

You can also calculate the exposure compensation by measuring the total lens extension. Note, though, that this will not work with telephoto or retrofocus lenses.

Example

A 50 mm lens is fitted to a 30 mm extension tube to take a close-up picture, and the focusing mount of the lens provides some extra lens extension.

Since we cannot measure the lens-to-film distance directly, it must be worked out indirectly. When the lens is focused on infinity, the extension from the lens mount is exactly the [illegible] focal length. The extra extension for [illegible] can be found by seeing how much the overall physical length of the lens increases over its length when focused on infinity. When focused on infinity, the lens extension must be the same as its focal length.

In this case:

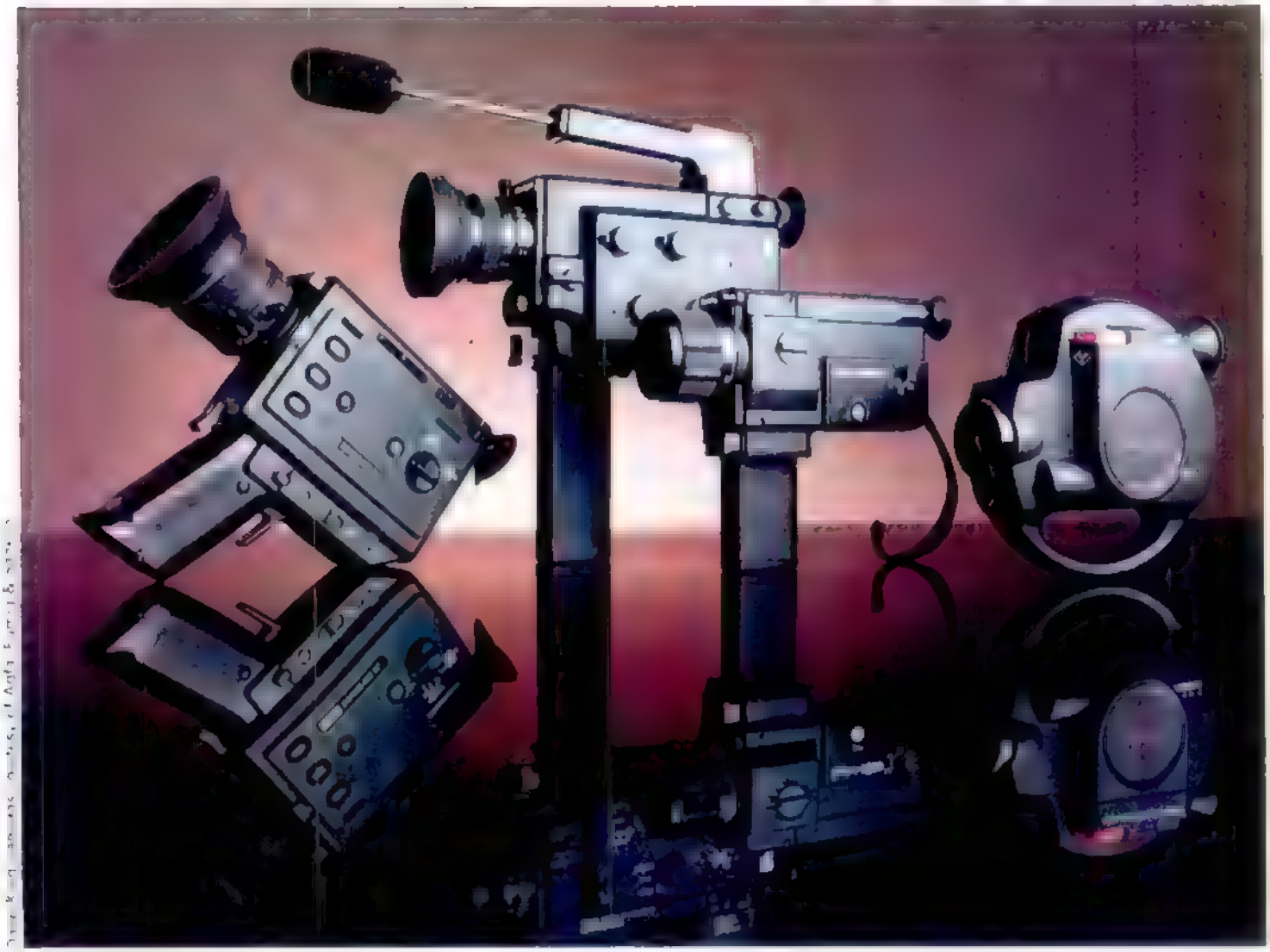
Lens length for close up		48 mm (A)
Length at infinity	–	43 mm (B)
Subtract B from A	=	5 mm (C)
Extension at infinity		50 mm (D)
Extension tube length		30 mm (E)
Add C, D, and E	=	85 mm
The total extension, then, is 85 mm		
Divide this by the focal length		85 / 50 = 1.7
Square the result to get the compensation		1.7 × 1.7 = 2.89

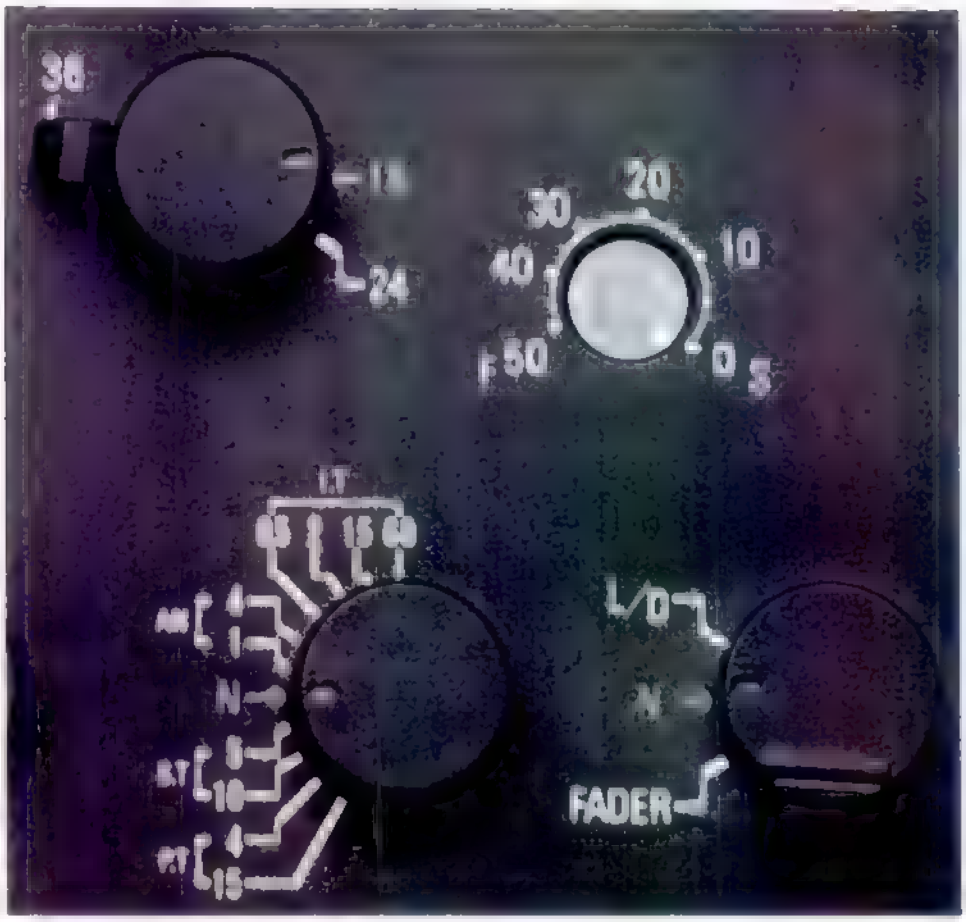
The estimated exposure time should be nearly tripled.

Increase in exposure time

Buying a movie camera-1

Stills photographers often enjoy the extra dimension which movie making provides. Many different movie cameras are available so you should find out just what you need before you buy





Dave King—camera—by kind of Sanyo

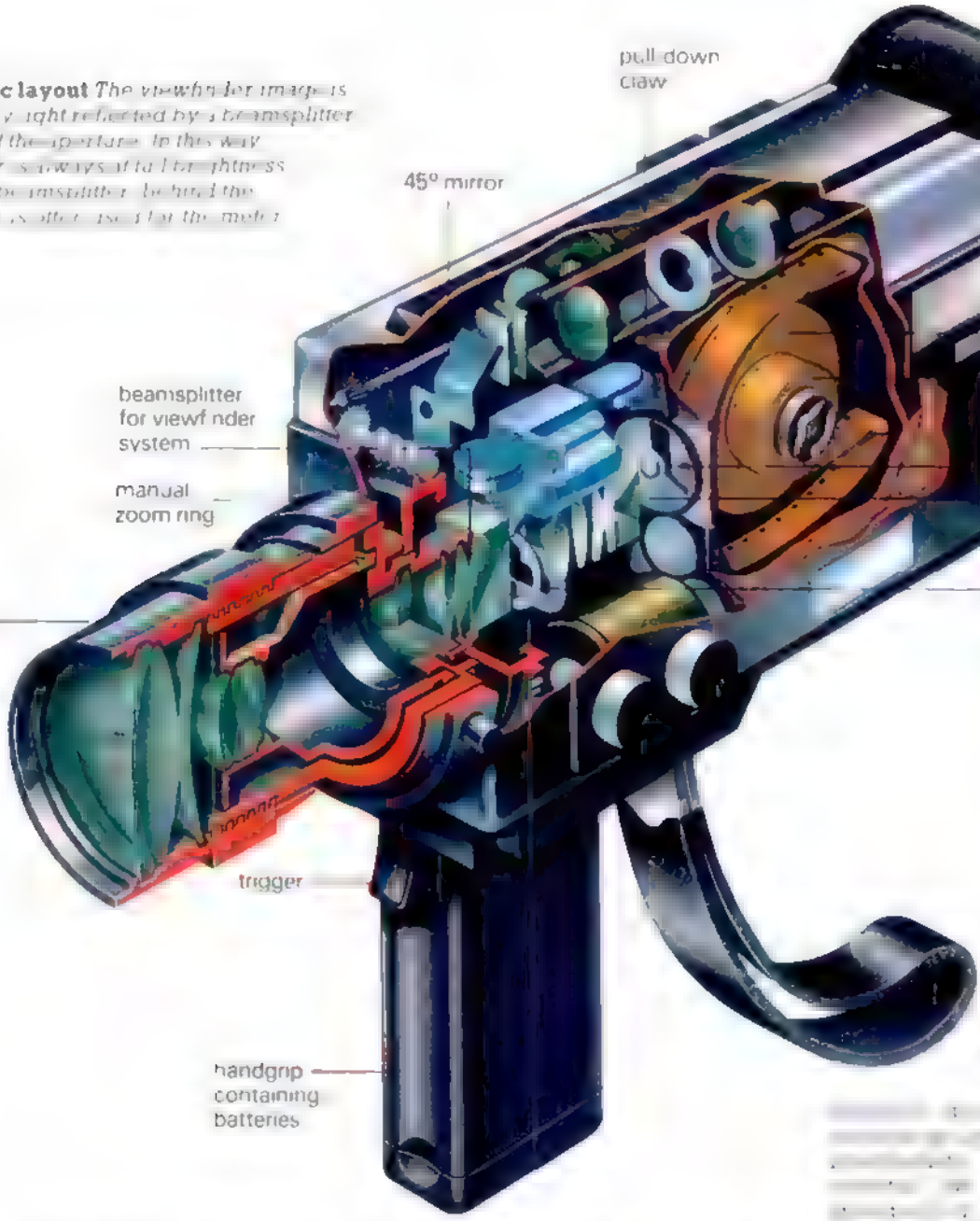
Range of control *The more expensive cameras offer a great deal of control such as extra filming speeds, fades, dissolves, interval timers for time lapse photography, self timers and so on. But such features are not vital, and if used only rarely, may not be worth the extra expense of the purchase price.*

Camera choice *Cameras vary from very simple, fixed lens models with direct vision viewfinders, to sophisticated reflex models with zoom lenses. But the more complicated cameras are not necessarily the best choice — it is a matter of deciding which sort of camera is most suitable for the type of filming you wish to do.*

Lenses

Viewing and focusing

The basic layout *The viewfinder image is formed by light reflected by a beamsplitter in front of the aperture. In this way the viewfinder is always at full brightness. Another beamsplitter behind the aperture is used for the meter.*



Film transport

Exposure

Lens choice *Simple lenses are often fixed focus and have low zoom ratios. The more common and versatile models offer focusing and high ratio power zooms. Many also provide the facility of focusing at very close distances, using a special setting on the zoom ring though zooming is not then possible*

Film stock

Sound and other facilities

Assignment

Power boat race

Speed, colour and spectacular action are features of powerboat racing, and are ideal ingredients for taking a series of dramatic pictures

At speed *Overlooking the course from a dock wall and using an 85 mm lens gave this frame filling action shot*

Winner's helmet *The 85 mm lens was also useful for isolating small details in the pits* **Start** *A side view is effective for photographing a start, but you need a fairly long lens – here, 180 mm* **Out of the turn** *Working from a distance, Nigel found that he needed a 400 mm lens for this action shot*

Wrong direction *For a more unusual view of a start, a 16 mm full frame fisheye was used. The main area of interest is the foreground where a boat has been turned by the wind* **Side view** *Panned shots must be taken at slower shutter speeds. Nigel advises against speeds slower than 1/125 sec*

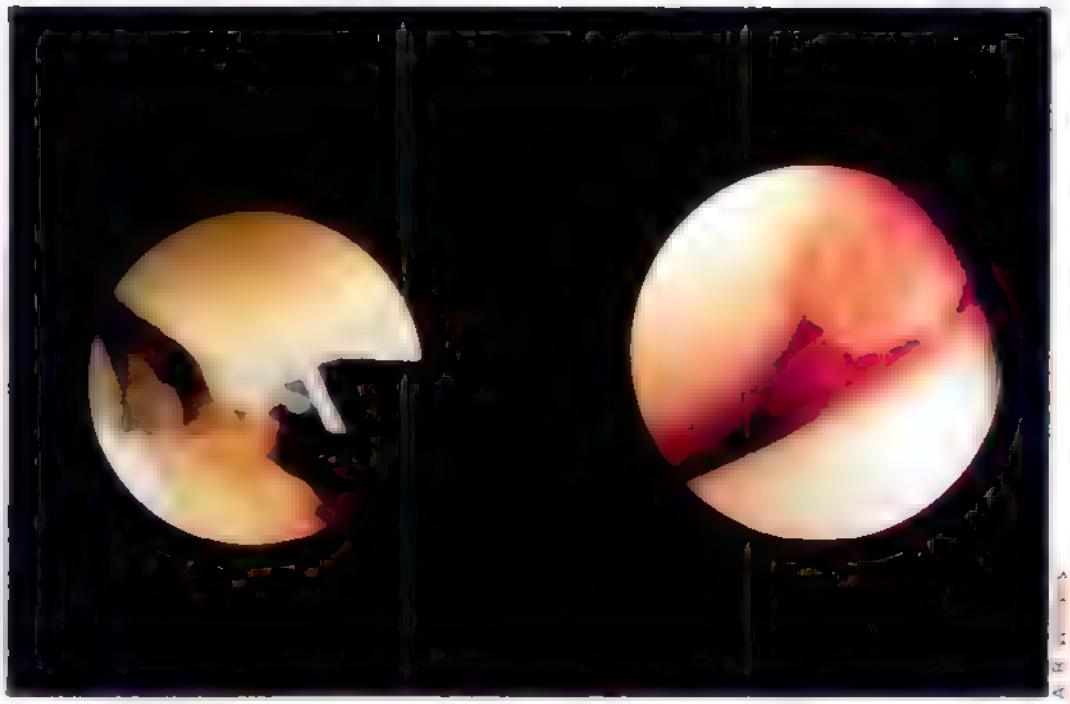
The camera in medicine

Using a variety of special photographic techniques and equipment, medical photographers can produce spectacular pictures for recording, teaching and diagnostic purposes

X rays *Doctors can obtain excellent pictures of a patient's skeleton using radiation. But many diseases can only be recorded by the medical photographer*

Clinical photography

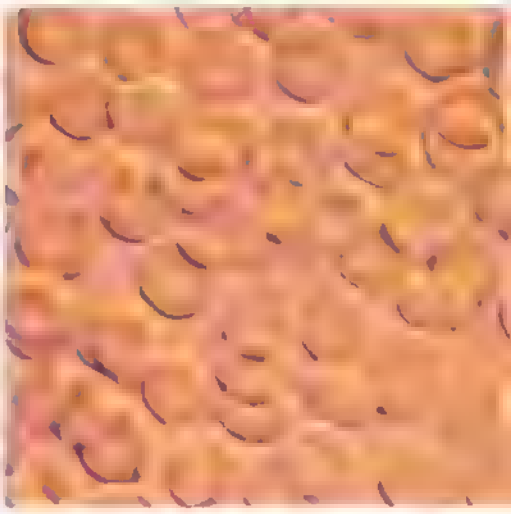
Endoscopy *The endoscope owes much to the developments in fibre optics during the 1960s. The large picture shows the proximal (or doctor's) end of the apparatus. Inset is the distal end, which enters the patient's body*



Photomicrography

Inside the body *These pictures taken with an endoscope show a damaged cartilage in the knee (left) and a polyp, or benign outgrowth of tissue (right)*

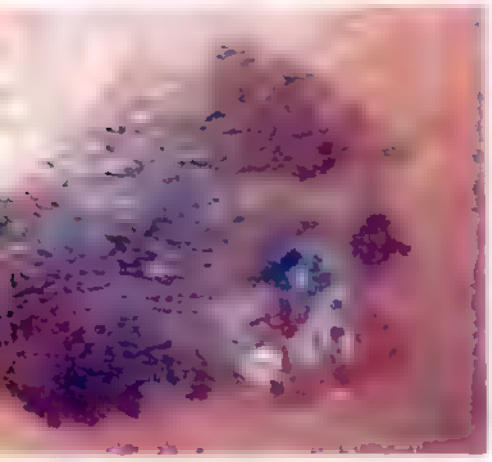
Photomicrography *Human blood cells magnified around 3000 times*

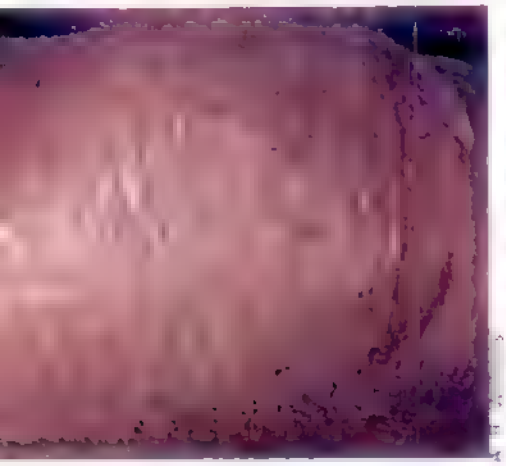


Seeing inside the body

Transillumination *The light source was placed underneath the specimen for this photomicrograph of a section through a gastric ulcer*

Clinical photographs *Two pictures of skin complaints under flat lighting*





Photogrammetry

Photogrammetry *By placing a slide composed of coloured lines over the light source, a multicoloured light section is produced (left). The contour map (right) was drawn up using stereophotogrammetric techniques*

[illegible]

[illegible]

Infrared photography

The near [illegible] of infrared light are to reveal elements in the body in a way which cannot be seen by the naked eye.

This is because some of [illegible] reflect infrared light in different ways to the manner in which they reflect [illegible] light. Infrared and [illegible] particles in smoke [illegible] show blood vessels near the skin or reveal the iris of the eye behind a cornea invisible in normal light.

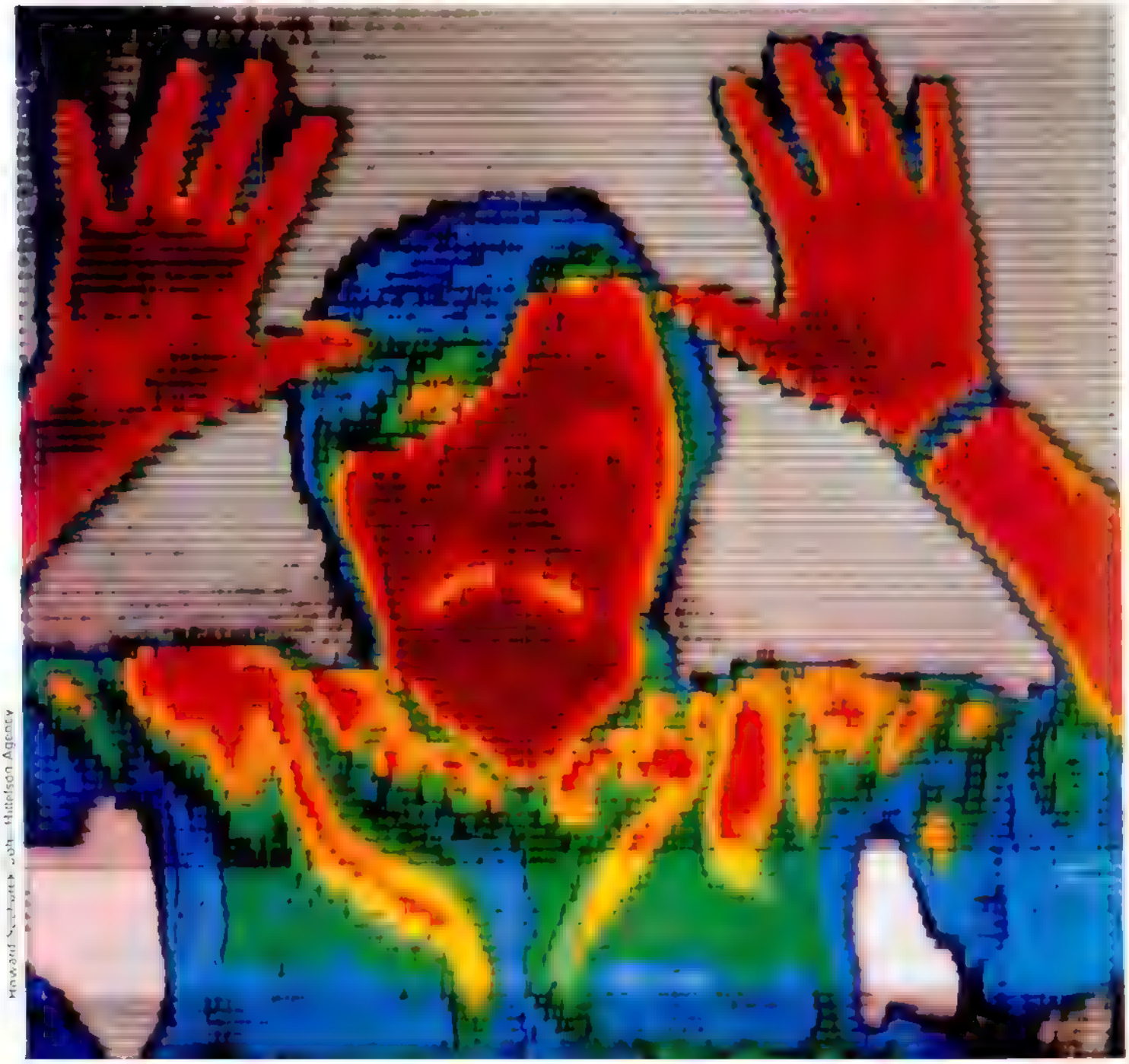
Most light sources emit infrared radiation and so almost any light source can be used. In practice the most definite is an electronic flash. High speed infrared film is used for black and white photographs with a filter over the camera lens which cuts out visible light.

Infrared photographs on [illegible] film can produce dramatic results because the emulsion layer that normally corresponds to purplish red light has been made sensitive to infrared. The dye coupled magenta layer produces [illegible] with the other two layers in the film cyan and yellow. Colour infrared film [illegible] return [illegible] green to red.

The other medical [illegible] is [illegible]

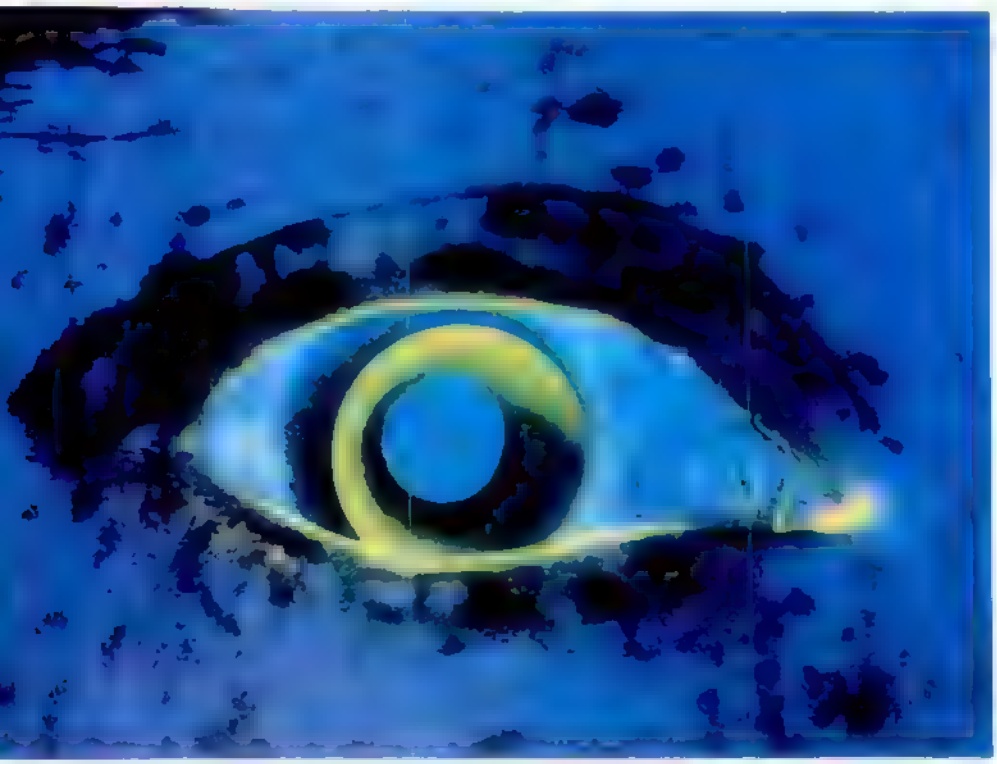
Ultraviolet photography

The principle of ultraviolet photography is similar to that of infrared photography [illegible]

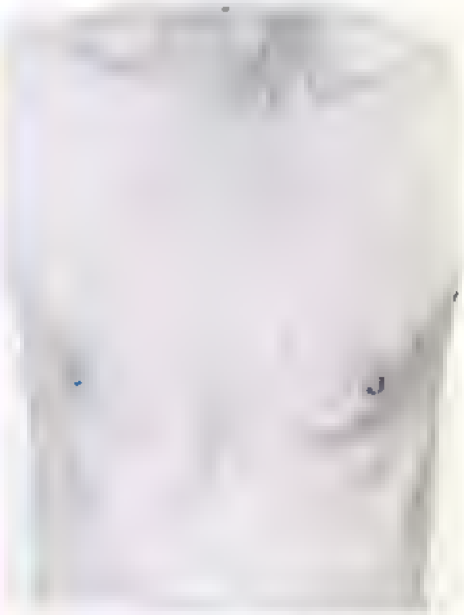


Thermography *The medical photographer may be asked to take pictures of the images formed by a thermograph. Such pictures will be used as records.*

Howard Sochurek ▸ John Hillelson Agency



Ultraviolet *Drops of fluorescein placed in the patient's eye reveal a crooked contact lens under UV light*



Thrombosis *Infrared light shows up veins invisible under normal light*

Baby's head *Water on the brain was revealed by this photograph. A strong light was shone through the subject*

Special effects filters

You can add colour and sparkle to brighten up a dull or lifeless picture with special effects filters. But for the best results, they must be used carefully and selectively

Special effects filters are no longer the exclusive province of the professional photographer; they are now widely available at a price that any amateur can afford. Because they are so cheap and easy to use, there is a great temptation to buy half a dozen at a time, and use them as often as possible, and this potentially results in a collection of indistinguishable photographs, all of which have remarkably similar characteristics.

The real skill in using any special filter is to use it sparingly, and sparingly. The effect a filter produces should enhance a picture, not overpower it, just as an accompanying pianist should complement a singer.

Graduated filters

The most straightforward and useful type of special effects filter is the graduated filter. This is a piece of glass or plastic that is half clear and half coloured. The boundary between the two halves is not straight—the two shade gradually together. Graduated filters are made in neutral grey, and in a wide range of other colours. Some manufacturers make them in two different densities—the coloured half is available in either a pale colour or a deeper one.

Although graduated filters are available in the usual circular mounts which screw on the front of the lens, you can use a very versatile version which takes the form of a rectangle of plastic and a special holder. The filter can be slid up and down in the holder and rotated (see page 77). This makes it possible to line up the boundary between the clear and coloured areas with any feature in the picture.

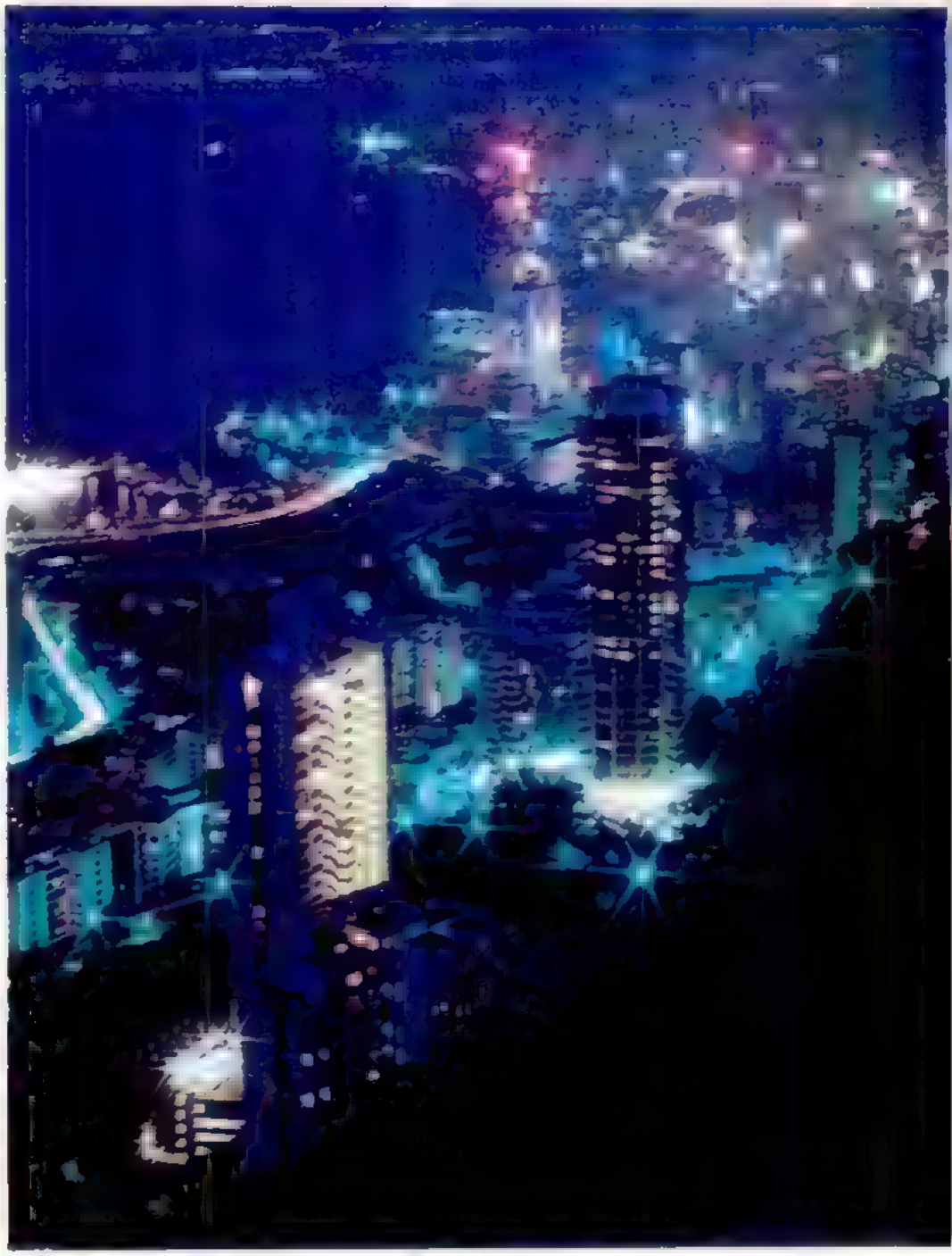
Graduated filters are most often used to darken the sky, or to change its colour, because the sky is so much brighter than the rest of the picture. It is usually overexposed in colour film. A graduated filter can vary this without cutting out light from the rest of the scene. By using a grey filter the sky can be made to look a deep blue. Without a graduated filter it often appears pale and weak. The paler of the two densities of grey produces a moderate intensity, but the dark grey graduated filter gives a very dramatic effect—rather like a tropical sky or an early morning deep blue sky.

Coloured graduated filters can also be used with a blue sky. A red filter can make the sky a richer shade of blue, but other colours can also be very effective. A yellow filter for instance will tint the sky from the sky, making it an attractive pale grey. By combining it with a polarizer, you can turn the sky almost black, without affecting the brightness of the clouds.

Some photographers rotate the filter so that the darker half covers the foreground and then take an exposure meter reading from the sky to determine the exposure. This technique gives great detail in the sky and renders the ground as a dark, featureless shape—a useful way of dealing with distracting foreground detail if you want to take a series of dull pictures. Generally, however, exposure meter readings are taken in the normal way when a graduated filter is in use. The filter only cuts out light from the sky and anything it should improve the accuracy of a TTL meter by preventing it from being too strongly influenced by the sky.

When you are using black and white film, graduated filters can improve a picture which includes the sky. Red and orange filters are often used to give very dramatic skies, but they have a number of disadvantages—first, they absorb a lot of light, sometimes as much as three stops. Second, since they strongly absorb blue light they tend to darken the sky, which is a sound scene which is illuminated by blue light from the sky. This increases the contrast and pictures taken on a sunny day with a red filter can be very difficult to print. A graduated orange or red filter gets round both these problems because it only acts on the sky and does not increase the contrast of the foreground scene or cut out any light from it.

If you use colour negative film and do not print it yourself, a grey graduated filter allows you to get better results from an enprinting or machine printing service (see page 6[illegible]) by effectively "burning in" the sky at the camera stage. As with colour transparencies, this gives a deeper, richer blue to the sky.



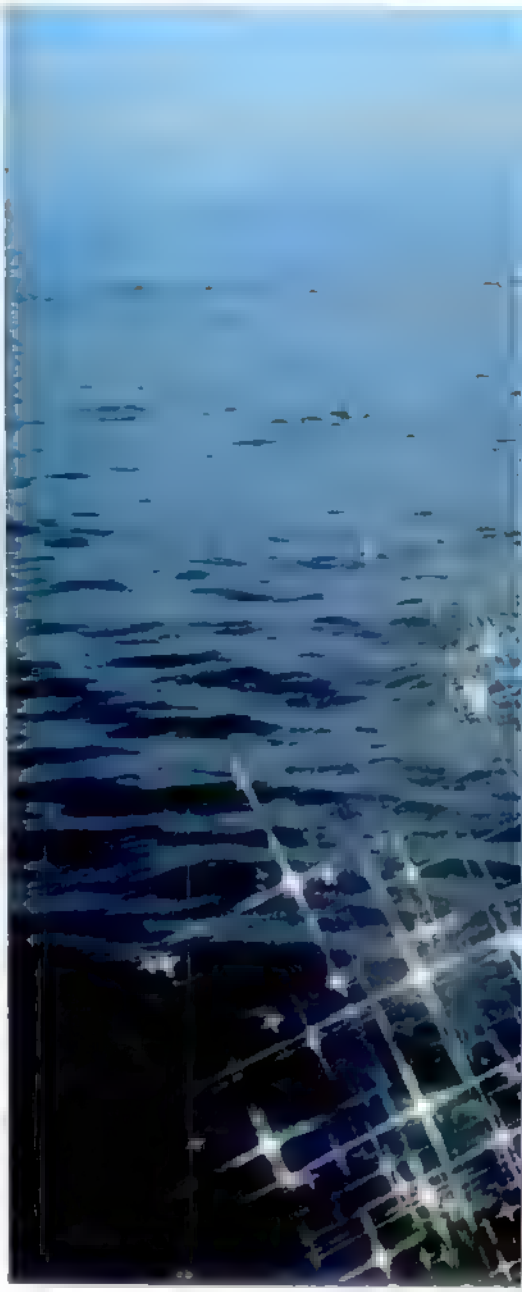
Eastern dusk *Used with subtlety, effect filters can transform a picture. Here, two graduated filters were used to darken the sky and the water*
Twinkling city *A starburst filter greatly improved this picture of Hong Kong, without totally dominating it*
Cartwheels *Prismatic attachments can sometimes be used for novelty value*

On dull days

Photos taken on an overcast day usually have blank white expanses of sky lacking in interest. Although a blue graduated filter will not produce a convincing blue sky from an overcast one, other filter colours can be used very effectively to relieve the monotonous expanse of new sky. This is particularly useful with wide angle lenses, which tend to take in more of the sky than longer focal lengths.

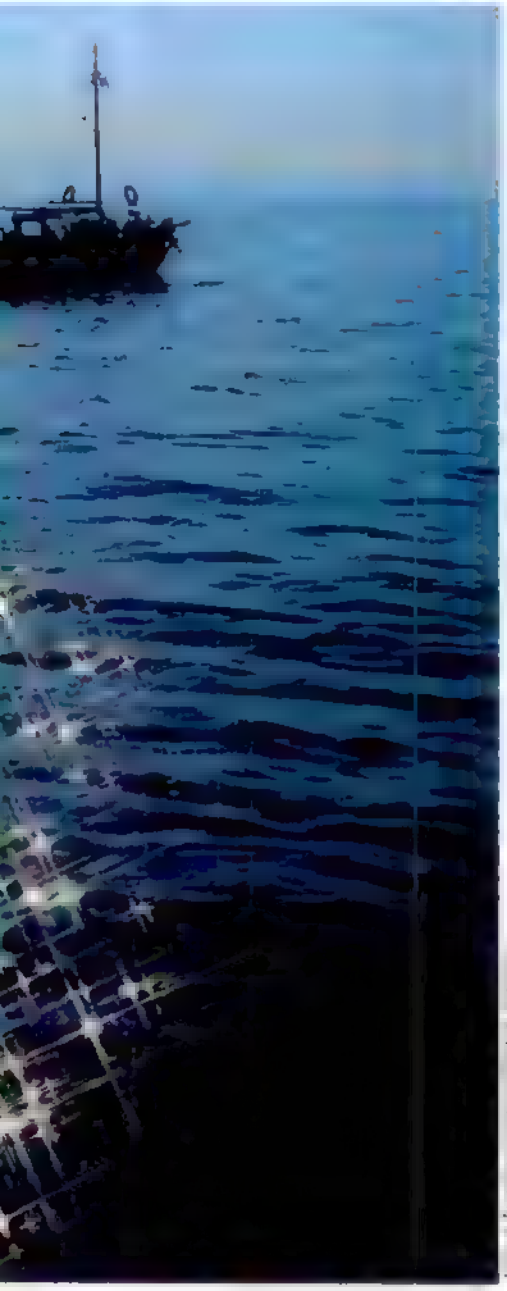
Graduated filters have uses other than darkening skies. Grey graduated filters can be used for flash pictures. By positioning the dark portion over the foreground, the level of illumination with flashes can be reduced, giving more even lighting. Because a graduated filter is placed close to the lens, the area of intermediate between the dark and clear portion does not appear sharp in the final picture. The exact degree of unsharpness, however, depends on the focal length of the lens being used and its aperture. Long focal lenses have very little depth of field so if you are using a graduated filter at the aperture on a telephoto lens, the area of transition is unlikely to be noticeable. On the other hand, on a wide-angle lens, you may find a sharp change of the transition. The only way to avoid this is to use two of the weakest graduated filters and overlap the areas of transition to give a more gradual transition.

A [illegible] you can use with a graduated filter, the working aperture [illegible]



Dark skies *Graduated filters are most useful for adding interest to a dull sky, either by making it bluer, or by giving it a stormy look. Take care if you are using a wide angle lens, or the boundary zone may be obvious*

Starburst filters



Add a sparkle *Starburst filters produce a pattern of brilliant daggers of light whereas diffraction filters give rainbow coloured circles or spots. Both work best if there are light sources or bright reflections in the picture*

Unlikely colour
Effects filters can produce quite unexpected colouring in a photograph. But you must take particular care to avoid hideous combinations

Judyth Platt/John Topham Picture Library

Starburst ship
The rotating mount fitted to starburst filters makes it possible to position the spikes where you want them

Adam Woolfitt/Susan Griggs Agency

should not use this technique yourself, though the larger the camera format, the easier it is to achieve.

Diffraction filters

Diffraction filters are similar in some respects to starburst filters—they give their best results in similar conditions, where there are bright light sources or reflections and a dark surrounding area. Instead of starbursts, however, diffraction filters produce a spear of coloured light (or a jagged line) in rainbow colours on either side of a light source. Like starburst filters, diffraction filters are scribed with lines, but in this case the lines are minutely thin and closely packed. They are so small that they are invisible to the naked eye. The lines cause diffraction when light from the highlights of the picture strikes them, and they split the light into its component colours, in much the same way as a prism does.

Because diffraction filters produce coloured images, they are of little use on black and white film, where a starburst filter has a more pronounced effect. On colour film, though, the effect can be used creatively to put colour into a scene that has little inherent colour of its own—such as a snow scene at night, or the concrete jungle of the inner city.

Both starburst and diffraction filters can be rotated in their mounts so that the lines of light that they produce can be moved in the frame to the position where they look most effective. Both types of filter should be checked at the working aperture before making the exposure, because, like graduated filters, the effects they produce sometimes look different when the lens is wide open. If your camera has a depth-of-field preview button you can do this, but if it has not, or if you are using a non-SLR camera, you will have to rely on trial and error to learn what the final result looks like.

Prismatic and multi-image filters

Faced with an unpromising subject you may be able to make some sort of interesting picture by using a multi-image attachment. This is a series of angular faces, cut or moulded on to a block of glass or plastic. Each face forms a separate image of the subject so the final picture consists of three or more identical images ranged around a fourth. The central image is usually clearer than the others, which often have coloured fringes around them owing to refraction.

When used with a subject that has bold striking detail surrounded by a dark or neutral surround, a multi-image prism can sometimes produce a rather pleasing result. A large variety of different prism patterns are made, but however ingenious they may seem in a catalogue, it is difficult to regard them as any more than a novelty. They can be used creatively once in a while, but the effect becomes tiresome if it is used too much.

Filter overkill

There are many other types of effects filters available. Some of them might be useful in circumstances where it would be otherwise impossible to produce an interesting picture, but many of them are of limited practical use.

Special effects filters are not a substitute for creativity and imagination, but some of them, particularly graduated filters, have a real value if they are used with discretion. Even the more exotic kinds are cheap enough to buy for amusement, and can very occasionally produce an interesting picture.

Children at school

As a subject, children at school offers plenty of scope for action shots, portrait studies and candids. But opportunities come and go quickly and much depends on your approach

Laurie Lewis

School can seem a closed world to adults, and few parents think of it as a natural place for photography. It does, however, take a major place in children's lives for many years, and is inevitably one of the strongest influences on the way they will think, feel and act. If you have a son or daughter yourself and are interested in recording the incidents and changes of childhood, the school years are an essential element to be included. Even if your interest is less personal and you do not have children of your own, school can be a fascinating and varied location for photography—a separate society from your own that offers plenty of opportunities for candid photography.

In general, children are easy subjects but when they are at school much depends on the situation. The school timetable dictates your opportunities, and the classroom, for example, needs a different approach from the playground. Inevitably, there will be restrictions on

Relay race *Using a telephoto lens and framing closely emphasizes the tension of the children waiting for their turn*

Group *Try shooting children when they are at their most relaxed, even if they are playing up to the camera*

Richard & Sally Greenhill

Richard & Sally Greenhill

Classroom *Once the children are used to your presence keep your eyes open for spontaneous expressions*

Tray *Using a wide angle lens with care you can extend the foreground and keep everything in focus*

John Ramsey

Chinese playtime *A high viewpoint lends playground shots more interest* **Painting** *Photograph children when they are busy, and try to include some of their work* **On the grass** *A telephoto isolates these two against the grass*

[illegible] and even with posed formal photographs you are likely to [illegible] the attitudes of your subjects if you are [illegible] of the exercise and have [illegible] with the [illegible] setting. This is the time when an [illegible] camera is [illegible].

To be prepared for as many opportunities as possible, make a mental list of the types of shot you are likely to find in a typical sports day, for example subjects will not just include the events themselves. You can use the quantifying hands to look around and discover the best camera position. Try concentrating on approaches other than the obvious action shots: include close-ups of the participants, stages of the preparations, [illegible] the reactions of the spectators, parents with children and finally the excitement of the prize giving.

Indoor events tend generally involve more [illegible] problems and may require the use of [illegible] say Ash [illegible] or portrait lens. Some events are other than [illegible] but the photographic possibilities will depend on the particular exercise.

For the more regular day-to-day school activities you will need to enlist the support of the teachers. This is especially true if you want natural and candid shots, for you will need to be around long enough for the novelty to wear off with the children. This might take the best part of a day, and then only if you try to keep yourself out of their attention. For informal pictures, the two locations are the playground and the classroom, the playground being, on the whole, the easier.

For candid photography, the playground is unrivalled. One approach is to stay at the edge and use a long focus lens. You will find that there are several children concentrating so hard on their activities that you will go unnoticed. Look out for close-ups of interesting expressions, full figure shots of children absorbed in some activity, and groups playing games.

If on the other hand you are prepared to become involved, you could move in closer with a standard or wide-angle lens. You can expect the types of attitude, expression and activity to be different. In this case, let the children show you what interests them—it is a great opportunity for them to show off, and you can take advantage of it.

Anthea Sieveking/Wide Angle International

By choosing the approach of involvement you have, in effect, entered the playground world, and so to some extent you will have to follow the tide of the children's interests. If a group of children set themselves up for an impromptu portrait, oblige them. Having taken the shot, however, you can expect to be besieged by other requests. Carry plenty of film and work quickly.

In the classroom, the atmosphere will be more formal and your presence is likely to be more disruptive, so the best approach is to have the teacher introduce you without delay. Explain what kind of photographs you want to take and why, and then sit down quietly out of the way until the children have lost interest in you. For natural, unposed shots of the children at work, use available light rather than flash. This will require high-speed film and, if possible, a quiet camera.

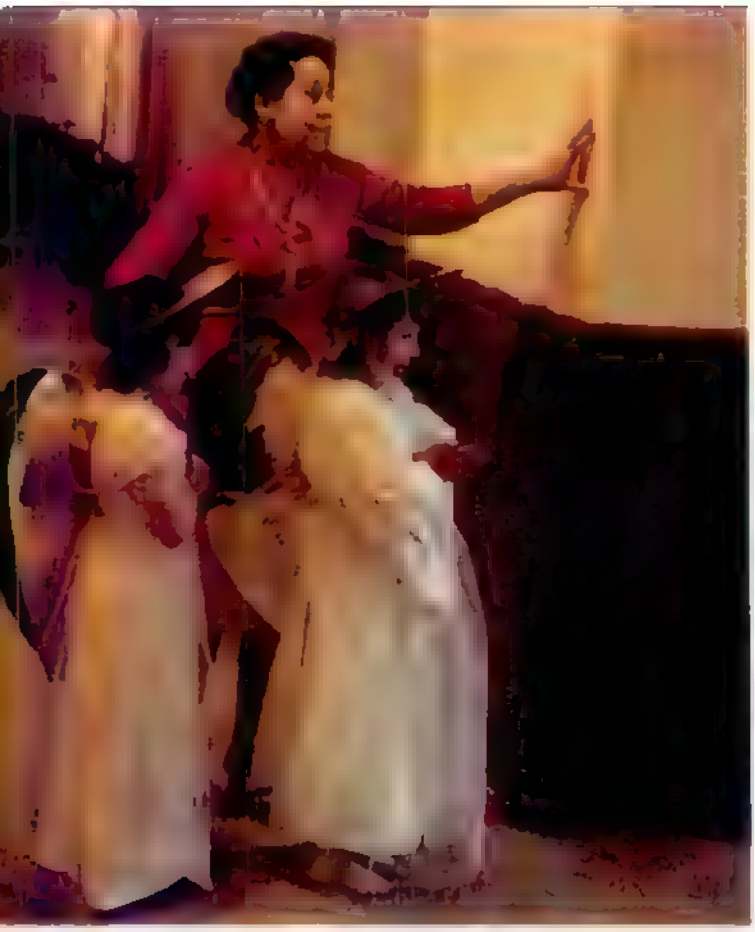
Classes in practical subjects, such as art, woodwork and cooking will give you the most interesting opportunities. Infant schools often provide more varied activities such as singing and dancing, although older children concentrating on their work in a science laboratory, for example, can produce very good pictures. Scientific equipment can add visual interest and it is very effective to show just what the child is working on, thus telling a story with your pictures.

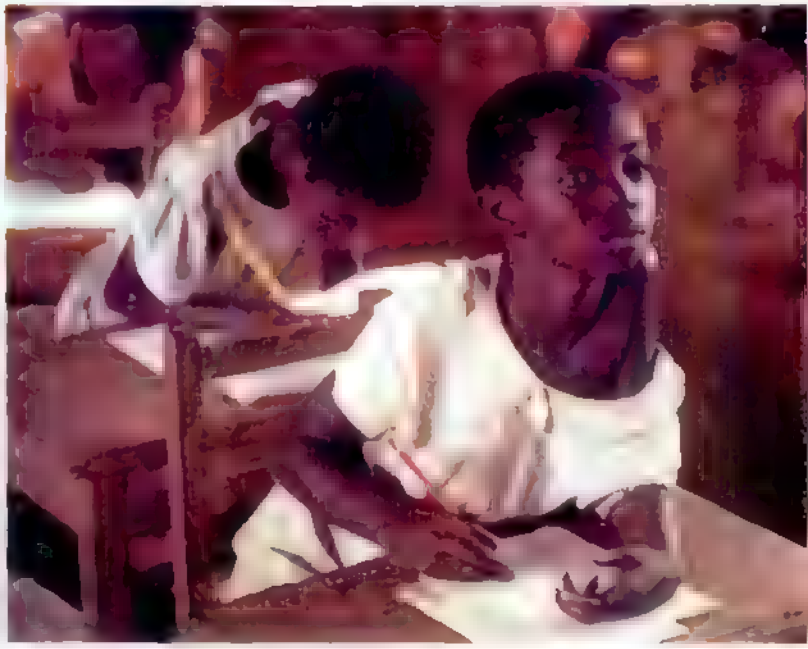
In the same way it is often a good idea

Geoff Gurney

Boys in grey *A wide angle lens from a high angle makes the most of a small and cluttered classroom*

School in the sun *If you can work unobtrusively, you may get some very natural and candid group shots*





Teresa Coleman Vision International

African child *You can take time to make a carefully composed picture while a child is concentrating hard*

Angels *School theatre productions are always good sources of material. Use fast film if the lighting is dim*

to include a background in the shot. This establishes the context of the activity in progress—perhaps the background will show mathematical problems or diagrams or a list of the characters in a play. The person looking at your photographs will immediately become more interested in the children and identify with them if he or she knows what they are studying. And do not forget the teacher. Activities probably make the best subjects for classroom pictures but interactions between teacher and children can also produce good shots.

If you become involved with the school you will almost certainly find yourself being asked to help perhaps with the setting up of the school darkroom. To start with, children will just want to take pictures of each other pulling faces—but you can lead them from that to taking photographs for school projects—perhaps taking portraits of members of staff or recording events in the school. If you do try a little informal teaching of the school's younger photographers, work with small groups.

All aspects of school life offer good opportunities and there is sufficient variety for you to expect more than just one or two good photographs from a single session. By planning to cover a number of different events and activities you should have the makings of a rich and interesting photographic essay.

Bob Fox Exclusive Vision International

Sight and the camera

Our view of the world is greatly influenced by colour. So it is useful to understand the way in which we see colour, and how this differs from the way photography records it

Colour is such a natural part of any scene that we tend to take it for granted. In normal light, the average person can perceive over 200 separate hues or colours. Surprisingly this range is achieved by varying combinations of just three basic sensations. The same principle applies to colour film—but with differences. These differences account for many of the shortcomings of colour film compared with colour vision.

The principle of being able to produce any colour from a combination of the three primary colours (see page [illegible]) is called *trichromatic theory*. The cone cells of the retina which are responsible for colour vision (see page [illegible]) are generally believed to be sensitive to each of the primary colours—some respond to blue light, some to red and some to green.

All other colours are represented by a mixture of signals from these cells. In a sense, the image on the retina is perceived in the form of a collection of blue, green and red dots. However, these dots are [illegible] and our visual system is constructed in such a way as to overcome this breaking down of the image.

The spectral sensitivities of the cells overlap. The way in which they do this means that different colours are not perceived as being equally bright. For example, yellow-green is the [illegible] spectral colour [illegible] three types of [illegible] always [illegible] but it only [illegible] [illegible].

Clearly the [illegible] sensitivity of a [illegible] would be [illegible] to the general [illegible] of the eye. In fact, although a particular [illegible] is sensitive to all [illegible] [illegible] page [illegible] its balance of sensitivity between the various hues is different from that of the eyes. A better [illegible] rendering [illegible] with [illegible] and white balance by [illegible] a [illegible] of yellow-green light [illegible] the [illegible] [illegible] of blue light [illegible] the film.

Another difference lies in the overlap between the sensitivity layers. The eye's red and green layers overlap to a great extent. For example, a pure yellow colour triggers off equal responses in the red cells and the green cells. The brain interprets equal amounts of red and green as yellow.

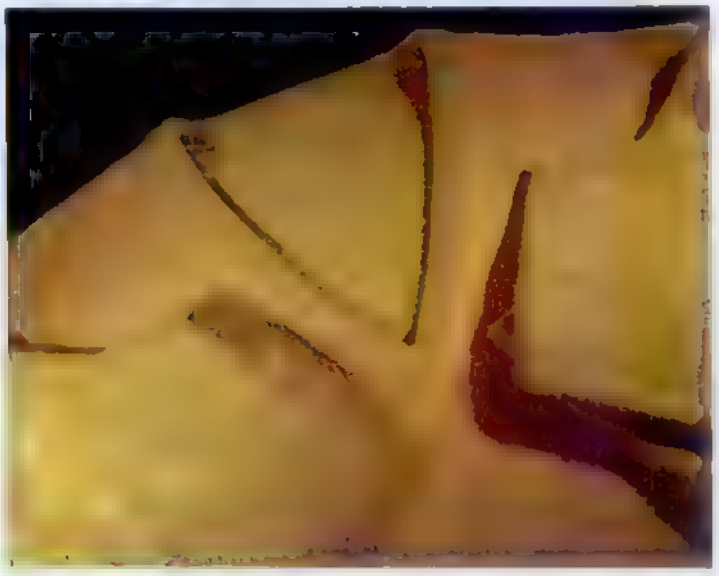
In the case of film, however, there is less overlap. Many films are tuned to respond to pure yellow, which is very strong, as there is a [illegible] sensitivity dip at that point. Most yellow colours, however, are not pure but lower [illegible]

A R Williams, London Scientific Fotos

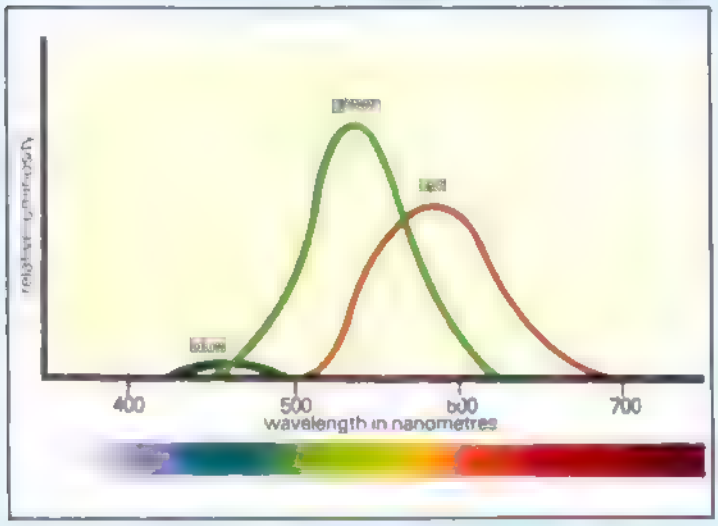
The fovea *The central part of the retina, responsible for sharp vision, consists of closely packed cone cells*

Paul Brierley

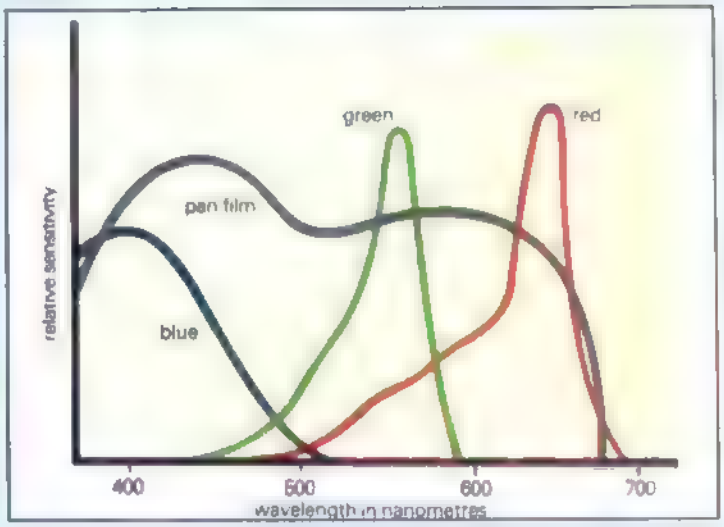
Tungsten light and film *Normal daylight film suffers from a colour cast. Subtle colour differences are lost*



Tungsten light and the eye *Colour adaptation allows human vision to discern different hues*



Sensitivities of the cells *The spectral responses of the cone cells greatly overlap to give a range of sensations*



Film sensitivities *The layers of colour film respond differently, with more prominent peaks and less overlap*

a wide part of the spectrum, so there are few problems in practice

Fluorescent lights photograph as green for similar reasons. They have an output with a strong green content, coinciding with most films green sensitivity. In the case of the eye however, the red layer is affected by their output as well as the green because of the overlap of sensitivities. So the eye sees the lights as white or even pink, while the film sees them as green

With colour films there are also important differences between vision and photographic processes. As the light level drops, human vision loses the ability to distinguish different colours But a colour film retains this ability, though there may be some reciprocity effects (see page 466)

Human vision has the facility of *colour adaptation* Sunlight, tungsten and fluorescent light, and a large number of other light sources all look equally white when seen individually. Only when going from one to the other, from daylight into a tungsten lit room for example, will any difference be noticed (the light in the room will appear yellowish) Within a minute or so however the brain compensates for the colour shift

Photographic emulsions do not have this facility to adapt People are often surprised at just how yellow a scene in tungsten light looks when photographed, or how red a late afternoon picture appears

Precise visual assessment of colour is made more difficult by the fact that response to colour is different from person to person. About a tenth of all males have truly defective colour vision though only half a per cent of females suffer from this Everyone has a slight colour bias, and this can cause problems when deciding on the correct filtration when colour printing. It is useful, if you intend doing any amount of critical colour work, such as printing, to have your eyes tested for colour vision

Assessment of colour is also affected by the subject s surroundings *Simultaneous colour contrast* is the effect which occurs when two different colour areas are put together At the point where they meet the difference in colour seems greater. This is due to temporary readjustments in the sensitivity of various cells. For example, anything which is placed near a bright green area will seem more magenta. This happens because the green cells have become fatigued and so are less sensitive while the other cells are unaffected. This is important when deciding on a surrounding for a picture, especially a colour print

A similar thing happens when you look from one object to another This is best demonstrated by staring at a brightly coloured image and then quickly transferring your gaze to a plain white surface You will briefly see an *after image*, comprised of the complementary colours to the original image (see page 551)

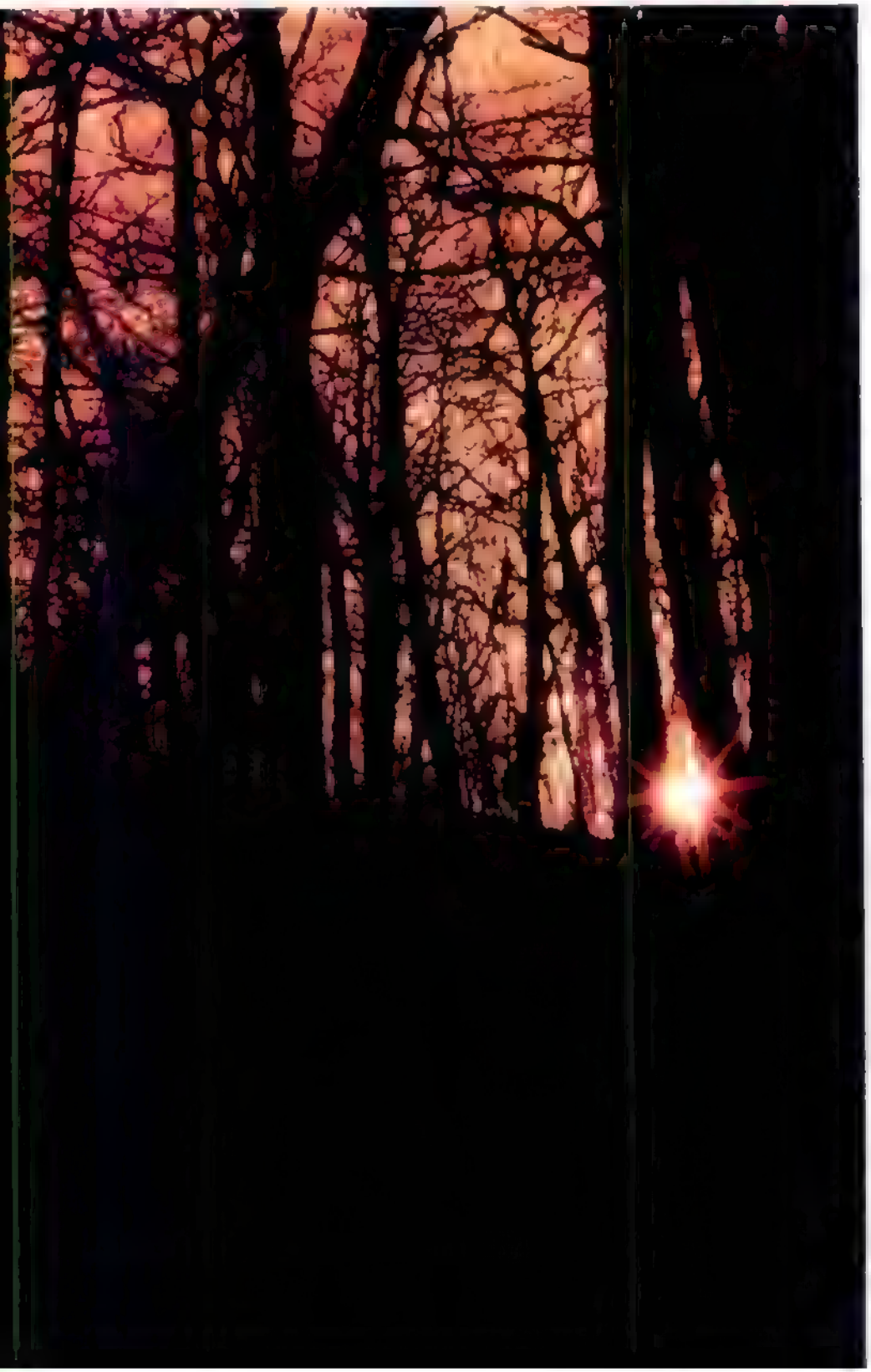
These effects are of great importance when they occur in the photograph itself However, when they are present in the subject, there is no guarantee that precisely the same effect will exist in a photograph of that subject There is a limited range of dyes used in colour photographic materials, and so colours are not always reproduced exactly

The differences in colour between a scene and a photograph of it are rarely noticed It is unusual to be able to compare them directly and allowances are automatically made for minor colour changes. Apart from a few subjects, such as skin tones and food, visual assessment of colour is seldom critical The hues of a photograph are governed by mechanical and chemical processes. But human vision has the added complication of various psychological effects. It is difficult to say which system human or photographic is the more objective

Simulated colour blindness *Typical colour blindness, simulated in the picture on the right, results in an inability to differentiate between red and green Normal vision is shown by the left hand picture*

Colour from black and white film

There is no reason why your black and white negatives should only give black and white prints. Without any special technique, you can use them to produce striking coloured images



Whereas a black and white print tends to show shadows as black or nearly black, a coloured print from a black and white negative shows coloured shadows, giving a natural effect similar to the dark colours seen in reality.

Coloured prints can also be made from black and white negatives which have been prepared in the darkroom with [illegible] the effects. Subtractive printing allows you to obtain subtle and unusual effects from these.

The printing process is the same as for normal colour, but as there is no colour in the negative this must be provided by combinations of filters. This is done, done by trial and error, but with time the degree of control can be achieved. In addition, filters must be used to provide the orange colour for which colour paper is balanced.

After the enlarger has been set up as for normal printing, the first step is to find a filter combination which produces black or grey on colour paper from a black and white negative. Begin by using a filter combination such as [illegible] (otherwise written [illegible]Y + [illegible]M), and produce a series of exposure steps at [illegible], 20 and 40 seconds as for a normal test print at say f/11. The resulting test print should range from soft black to white. If it is too light or too dark, adjust the aperture accordingly. When the print is dry, view it carefully under natural light. If it shows a colour cast, you must adjust filter combinations to find neutral balance.

You do this in exactly the same way as for normal colour printing. To reduce a colour cast, either add filtration in the same colour or reduce filtration in the complementary colour. Thus if the print is too red, add equal amounts of yellow and magenta filtration. If it is too blue, subtract yellow. Too much magenta can be corrected by adding magenta. This should be done in fairly small steps. For example, if a print is too red at 65 Y, then 60 Y 45 M might produce a neutral tone.

If your range of filters is limited or you cannot achieve a neutral tone, a frame

Woodland sunset *Subjects like this are ideal for printing on colour paper and the result is often more striking than that from a colour negative*

John Ward

Hairstyle *An unusual image can be made even more effective by the use of an appropriate colour*

Making a test print

Lake scene *A colour cast can change a landscape completely, suggesting either evening light or early morning sun*

Testing for density and colour

The first test print for neutral grey (right), was exposed for 5, 10, 20 and 40 seconds, with filtration at 65 30 00. Although it shows a sufficient range of densities, the tone is not a neutral grey, and the print is too warm. To make the test print below, filtration was adjusted to reduce the reddish-brown colour cast Yellow and magenta filter values were increased by equal amounts to 80 45 00, while the paper was given the same exposure times The resulting print shows neutral grey in a good range of densities The colour test print (below right) shows the basic range of colours From left to right: red, green, blue, neutral grey, cyan, magenta and yellow Filtration and exposure were: red (20 10 00) 10 sec; green (60 45 00) 18 sec, blue (100 45 00) 18 sec, neutral grey (80 45 00) 15 sec, cyan (100 85 00) 20 sec; magenta (65 10 00) 12 sec, yellow (20 45 00) 13 sec Filter factors were allowed for

Tim Stephens

Lila Mace

Glamour shot *Another example of the way that choosing the right colour can add to the atmosphere of a shot. Here the tone not only lends the picture a pleasing 'period' quality, but it gives a suitable colour to the skin*

bination for the first colour, lift one of the card strips, and make the exposure. Replace the strip, adjust the filtration for the next colour, and repeat for the next strip. Expose each strip in turn until the entire test print has been covered.

Unless you have dial-in filters, it is advisable to lay the filters out in order so that you can find them easily in the dark. Start by exposing the colour requiring least filtration (in this case red) and proceed to the colour requiring most filtration (cyan), adding filters as you go.

The results of this test will show you how the paper reacts to different filter combinations. However, they will only be valid for a given batch of paper, so make a new test for each new batch.

Printing your negative

Before making your first print, study the test chart carefully, noting the exposure times. With prolonged exposures some colours change—yellow, for instance, tends towards red. It is therefore essential to follow your test exposure times exactly. In trying to achieve a particular effect, you should also bear in mind that the closer the filter setting is to neutral, the gentler and more subtle the colours will be. The further the setting is from neutral, the more saturated and brilliant the colours will be.

This allows you to exercise [illegible] control over your final result, since you can give brilliant, unrealistic effects or soft, pastel tones. The colours you choose will depend on your subject as well as on your personal taste.

To make a single-colour print, simply set the enlarger to the colour filtration you want, using the colour test print information. Put the black and white negative in the carrier as usual, and when you have lined the image up on the easel, expose the print and process it in the normal way. The result will be a positive print with an overall colour cast, including coloured shadows.

For a multi-coloured print, decide which areas of the print require which colours and make a note of the filtration and exposure for each colour. Bear in mind that you will have to change the filtration in the dark, so any notes you make should be visible by the light of the enlarger alone. All colour printing must [illegible]

During each exposure, a part of the print is 'coloured in', and the rest of the print must be covered for that exposure.

You can shade areas of the print with a shading tool, as explained on page [illegible] or you can make a jig (see page 362). If the jig is slightly raised above the paper level, it gives a slightly soft outline. Where a sharp edge is required, you can tape one or more masks, cut to the outline you want, to the easel. Slide the paper under them, and arrange them so that you can hinge them up as the successive exposures are made, without needing to switch on the light.

Where a colour is meant to [illegible] into another, use a shading tool [illegible] keeping it moving continuously to avoid sharp edges of colour.

Set your filter combination [illegible] colour you want to print, and [illegible] exposure timer if you have one. After masking off all areas which are not to be coloured, make the first exposure. Switch the enlarger light off and [illegible] the easel with a sheet of thick black card to protect the paper from the light. Switch the enlarger on, change the filters and reset the timer for the second exposure and switch the enlarger off. In the dark, you will now have to [illegible] the black card and rearrange the masks or the jig as necessary.

The process can be repeated as many times as necessary to produce the colour combination you want.

Using reversal paper

There is no reason why you should not print in this way directly on to colour reversal paper. The process is in fact simpler than for normal paper, since all you have to do is project the colours of your choice on to the paper. In effect you are painting with light.

Both Ektachrome R 14 and Cibachrome reversal papers can be used. When using a negative original, these will give a negative print, but the process is particularly effective when printing from positives made in the darkroom for various special effects.

When you have set up the enlarger as normal, dial in the filters that you would use for a typical transparency. The orange mask is now not needed. With the enlarger lens stopped down to *f*/11, expose a test print in steps at 5, 10, 20, 40, and 80 seconds. Process the print and, when it is dry, examine it by natural light for any colour cast.

To correct the colour cast with reversal paper, the procedure is the opposite of that for normal colour paper. To reduce a certain colour, you must reduce the filter value of that colour, not of its complementary, as in negative printing. Thus, if a print is too blue, you add yellow filtration; if it is too yellow, subtract yellow filtration, and so on.

Abstract leaves *Here the natural colour has been exaggerated, and given to the background. Filtration was 75 180 00, and exposure was 25 seconds*

John Ward

Garden trees *With 30 15 00 filtration and a seven second exposure, this shot was turned into a sunset. The enlarger was moved slightly to blur the image*

Buying a movie camera-2

If movies have certain advantages over still pictures, movies with sound seem to have still more. But there are many different movie sound cameras and systems to choose from

For many years movies were silent and the only sound accompanying a film was the blast from the mighty Wurlitzer. Nowadays however the talkie is so universal that a movie without sound seems a little odd. You can add sound to your home movies by simply playing a tape recording as you project the film but this very basic method cannot give anything like the synchronisation needed for speech and special sound effects. If you want sound on film therefore you must buy a movie camera that is designed for recording sound.

Early attempts at providing amateur movies with *in sync* — that is, with the perfect synchronisation of sound and picture essential when filming speech — needed complicated and expensive equipment. With professional film speech and music can be recorded in perfect synchronisation and with surprisingly high quality reproduction.

A sound stripe is a narrow ribbon of magnetic tape or paste. It is applied to an otherwise unused part of the film on the opposite side to the image to the perforations. Before the introduction of sound recording for the amateur, stripe was added to the film after processing for a sound track to be recorded after as the film was run on a projector with a head in recording head. This method is still used by some people but most modern amateur movie cameras use a method which allows for synchronisation of sound and image at the time of shooting.

There are basically two methods of recording sound on picture film systems, and [illegible] both [illegible] to the [illegible] problems [illegible] and using a separate tape recorder [illegible] to the camera. A [illegible] is generated either by the camera or by a separate [illegible]. The [illegible] tape recorder for film purposes. When [illegible] the film [illegible]

The extra dimension of sound *Live sound recording gives added realism to movies. It allows you to film subjects, such as people talking, that need sound to make sense*

Steve Mansfield Camera courtesy Eumig

Single system options *The microphone can be part of the camera —usually on a boom arm—or separate. The latter type avoids noise from the camera motor being recorded*

Dave King camera courtesy Sanyo & Eumig

Film choice *The range of films for Super 8 cameras is much more limited than for 35 mm. The top pictures show the results given by slow film (left) and fast film —Kodachrome and Ektachrome respectively. Below left is the result from Type G film. The colour balance is a compromise between daylight and tungsten. The last picture was shot on 35 mm*

Dave King. Camera courtesy Sanyo & Ewing

Double system sound *Cameras with flash sockets can be linked to a tape recorder. Usually a tone generator is needed as well, though some cameras have these built in*

Dave King/Camera courtesy of Eumig

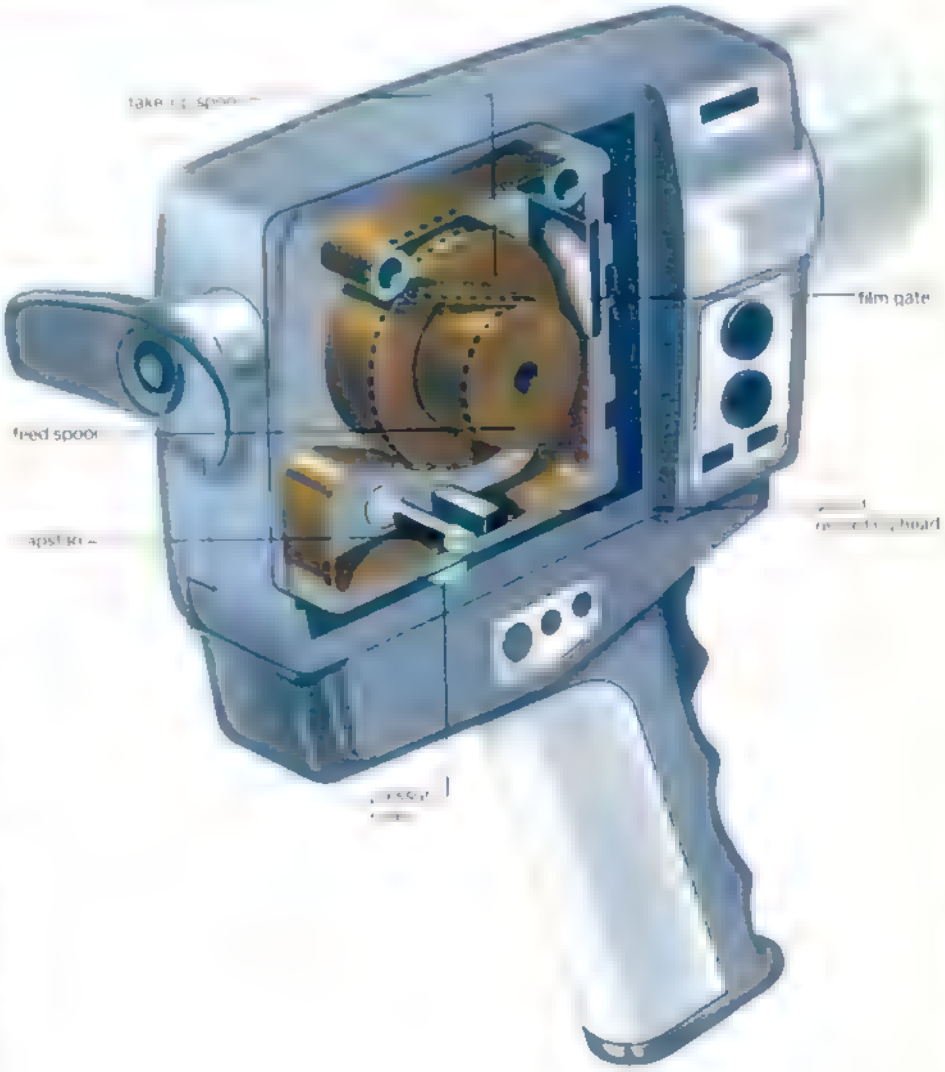
Film cartridges *Like silent film for Super 8, sound film comes in cartridges that can be simply slotted into the camera. The sound cartridge (left), though, is considerably larger*

not give a proper indication of what is and is not, being picked up. It is particularly useful to be able to check for camera noise, especially when using a separate microphone which may be more sensitive than the built-in type.

Other features which you may find on more expensive cameras include fade and dissolve effects. Fade mechanisms generally decrease the sound level to zero. Dissolves do the same but then rewind the film so that the next shot can be faded in. These functions are normally directly linked to similar features controlling the picture, with the sound automatically by the camera.

Filming with sound involves extra considerations and care, and often requires a different choice of equipment. Look for a camera with a sound system that suits the type of filming you expect to do. If you usually film static or stagey scenes requiring good sound, such as concerts, double system recording is best. But for general purpose work single system is usually adequate, and because it is simpler to operate the novice market is free to concentrate on the subject.

The film in camera *The large opening in the sound cartridge is to allow the camera's recording head to contact the sound stripe. This head is some distance from the film gate*



Vinnie Artess

Unless very precisely timed, the happy result is a distorted, jumping effect. To avoid this, some cameras feature a control which limits the gain of the amplifier. This is useful for speech at short distances and effectively suppresses the background noise. More sophisticated and expensive cameras incorporate a control for adjusting the record level manually. Though this method needs careful monitoring, it gives the cameraman much more control. If you intend to take your filming seriously it may be worth spending a little more to buy a camera with this facility.

To allow the filming speed as well as the ASC time to settle down, some cameras do not record sound for the first second of each shot. If the film is screened without editing, these gaps can be irritating. Recent designs have reduced the sound gap to a fraction of a second, or even eliminated it altogether. With these designs there is often a slight hesitation after the trigger is pressed before the film starts to run.

To obtain good quality sound it is very useful to be able to listen to the sound being picked up by the microphone before the start of a shot. Most cameras feature a monitoring device with a socket for headphones or an earphone. It is a useful [illegible] the [illegible] down on the [illegible] the [illegible] [illegible] and [illegible]

Assignment

HAMBURG

Despite its bulk, a long telephoto can be the ideal lens for use in the city, especially for cityscapes and candid shots of street life

[illegible] and [illegible] features [illegible] for interesting [illegible]

The [illegible] lens is particularly suitable for photographing [illegible] be used to [illegible] from the [illegible] also create fascinating juxtapositions of [illegible] and [illegible] features.

[illegible] of George's first [illegible] was choosing the equipment to [illegible] the assignment. The [illegible] was pale [illegible] shooting was impossible at speeds of less than 1/125 second, a heavy tripod was also essential. George took a Nikon FM body, polarizing and [illegible] filters and several rolls of Kodachrome 64.

As an experiment, he [illegible] using an Olympus [illegible] of the [illegible] of equipment [illegible] lighter than the Nikon.

Street scene *Despite the weather George Wright has managed to include colour and movement in this picture* **St Michael's church tower** *was the high viewpoint that George chose for most of the scene setting shots* **Trains in the rain** *The drizzle added atmosphere to this shot.* **Seedy Hamburg** *Avoiding overexposure George has captured the essence of the Reeperbahn at dusk* **Lovers** *The 300 mm lens provides the ideal opportunity to see without being seen* **Hamburg skyline** *This beautiful shot was taken by catching the reflection in a shop window*

George Wright

Winding road *By incorporating a strong diagonal into this shot, George has added interest to the picture and successfully broken the rectangle*

Going home *Commuters leave the city as the sun begins to sink, casting long shadows*

Man and bicycles *This image, taken using the mirror lens, lacks the contrast of those taken through the Nikkor*

Roland and Sabrina Michaud

Seasoned travellers and photographers, Roland and Sabrina Michaud have spent many years in remote parts of the world recording ways of life that are virtually untouched by modern 'civilization'

Swept by the icy winds of winter, a vast shimmering desert stretches out into the distance before rolling up into the majestic snow-capped mountains of the Hindu Kush. At the foot of these mountains can be seen a line of tiny figures—men and animals seemingly engulfed by the awe-inspiring landscape that surrounds them. On closer examination the figures crystallize into the shapes of fur-clad men hunched up against the cold wind leading a string of laden camels and packhorses across the desert. It is one of the caravans of Tartary on one of their twice-yearly voyages south through Afghanistan—voyages that have changed little for hundreds of years.

It is scenes such as these that Roland and Sabrina Michaud photograph so well. The Michauds spent four and a half years in Afghanistan, capturing the spirit and essence of the people who live in its remote places. The remarkable photographs that resulted from this visit form the major part of the *Caravans of Tartary*, a book which gained the Michauds an international reputation.

The Michauds are travel photographers in the true sense of the word. They have spent most of the past 20 years on long explorations of different oriental cultures, witnessing ways of life virtually untouched by the vast changes which have occurred elsewhere.

Their aim in travelling has not just been to pursue an exciting way of earning a living photographing exotic people and scenes, but to thoroughly explore and portray to others something which they consider of prime importance—the natural harmony between man and his environment in remote places.

In order to do this they have often sacrificed the luxuries and sometimes even the necessities of life. Living in remote areas far from the comforts of so-called 'civilized' life, they have always involved themselves in the culture and everyday life of the people they are studying—learning their

Sabrina and Roland Michaud *with their son. They find that people respond better to them as a family group*

Caravan of Tartary *(top) Camels loaded with goods on their long winter trek across 'the roof of the world' to trade with neighbouring tribes in the south*

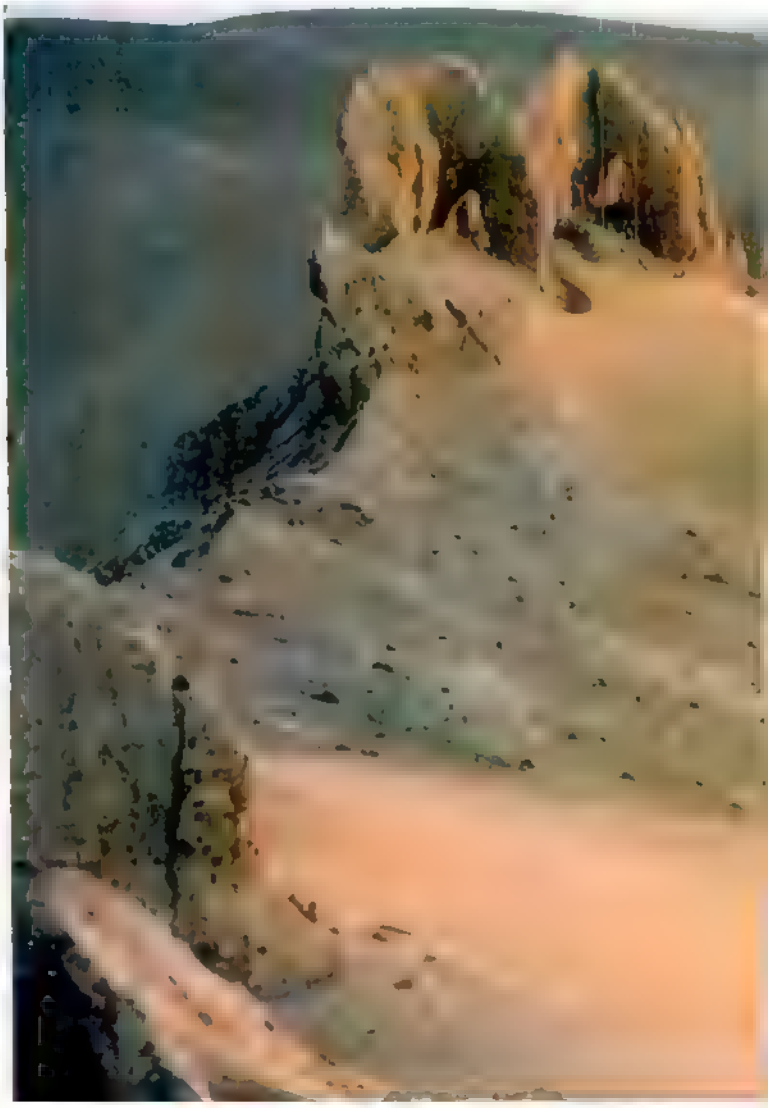
Bibi Djamal *This young Kirghiz woman is mourning the death of her new born baby—killed by the cruel winter*

Afghani traditional dress *Three women of Mazar-i-Sharif wearing their chardi—an all-covering veil that protects them from the gaze of strangers. The exotic coats of the boys (right) are woven from silk dyed using age-old methods*

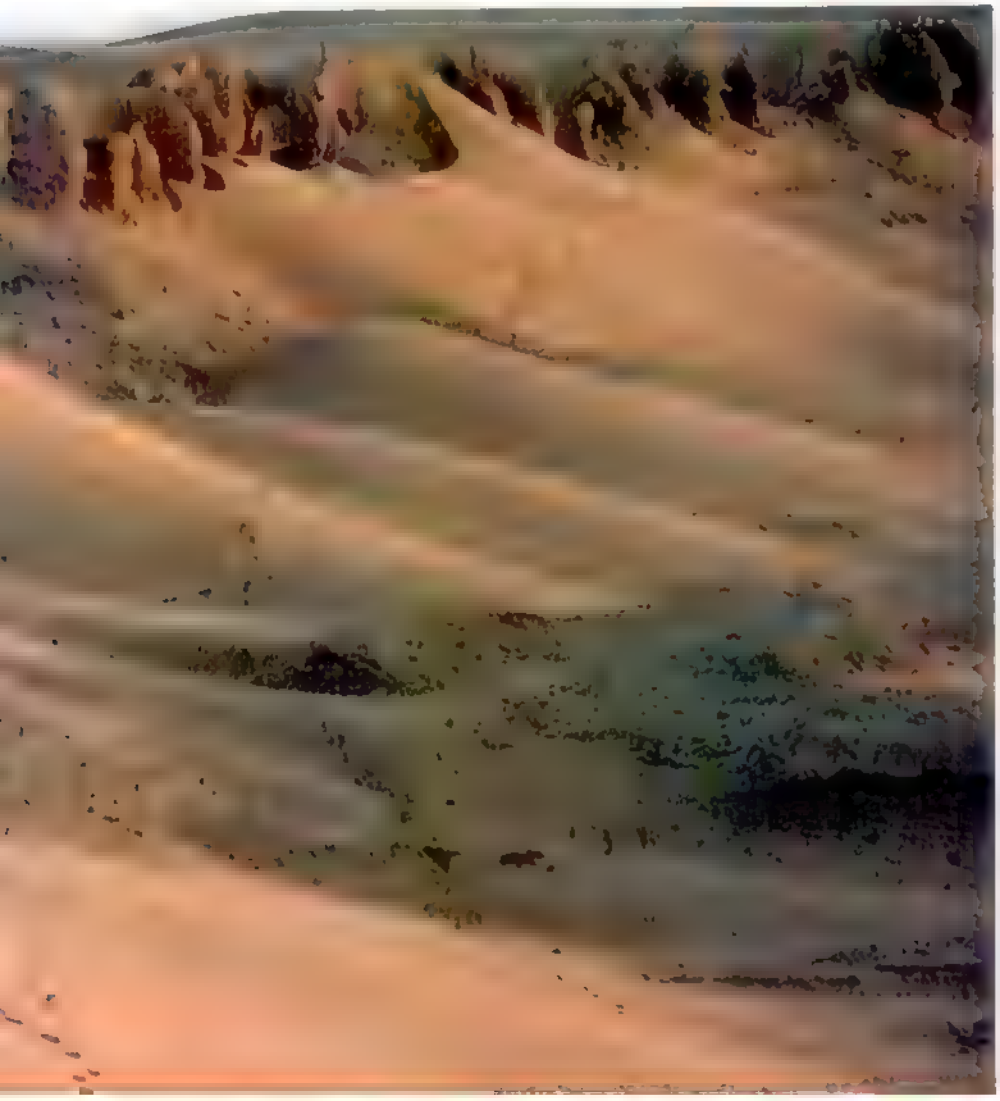
Rugnd and Satrna M[illegible] Ta[illegible] [illegible] H[illegible] [illegible] Agh[illegible]

Traditional ways of life *For hundreds of years Afghani horsemen have engaged in the spectacular boz kashi, competing fiercely for possession of a headless calf. The* **women** *too, still weave the traditional designs of past centuries. Such ways of life have changed little since* **Shar-i-Gholghola**, *its ruins now uncovered by the shifting sands of the Nimruz desert, was a great city.*

Roland and Sabrina Michaud The John Hinde Photo Agency



Winter scenes *An old Turkman relaxes with his grandchildren. Higher up in the range of mountains known as Band i Amir the temperatures are so low that vast waterfalls are completely frozen during the long, harsh winter months.*



Making the most of compacts

With the right techniques, you can use an inexpensive compact camera to produce shots just as good as those from a costly SLR

Ed Buziak

Today's simple compact cameras, if used with care, can give results which are practically indistinguishable from those taken by an expensive single lens reflex. Indeed, in some circumstances they can be more suitable than an SLR, so the results will actually be better. Many of them have excellent lenses, and if you choose the right subject, they can produce results of professional standard.

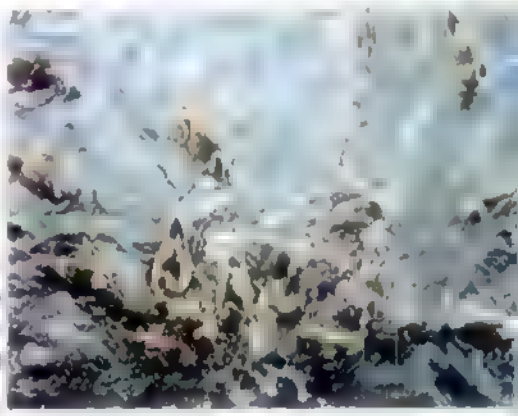
Quite a few professional photographers carry small 35 mm cameras around in their spare time, and leave their heavy SLRs at the studio. The best way to make the most of a compact camera is to recognize its limitations and its advantages, and to use it in the most appropriate circumstances. Compared with an SLR, a compact's drawbacks are its fixed lens, its often limited control over exposure, its separate viewfinder [illegible] with no indication of correct [illegible] of versatility. Its advantages are light weight, simplicity of use, and in some cases its less complicated lens. Some of these advantages can work against the unwary photographer, however, so it is important to recognize what the problems are.

Hold the camera steady

One of the most common causes of bad pictures from small, simple cameras is camera shake. Some small cameras weigh very little, particularly if there is extensive use of plastic in their construction. Every little movement of the hand is liable to jar the camera and blur the picture.

Camera movement can be overcome by using a sufficiently fast shutter speed but on many compact cameras there is no indication of the shutter speed in use. On the popular Olympus Trip, for example, it can be either 1/200 sec or 1/40 sec (see page 383). Camera shake is

Red van *Compact cameras give their best results when the subject is composed of large bold shapes and colourful patterns. Try to avoid images like that below, where the subject is scattered across the frame, or blends into the background*



George Wright

Unsteady posture *Camera shake ruins many pictures made by compact cameras, and a posture like this encourages it*

George Wright

A firm grip *By bracing yourself against a railing or wall, it is easier to grip the camera and eliminate vibration*

[illegible] reduce the effect of camera movement. A few automatic cameras have a warning light in the viewfinder which comes up when extra support is needed and it is important to pay attention to this. Cameras that have been frequently [illegible] that. Sometimes a tripod is necessary when the light is very low. If you have the time to [illegible] the camera steadily [illegible] to make use of natural light without the need for a tripod.

Many advanced cameras leave the user to set the aperture after which the camera decides on a shutter speed according to the [illegible] of the prevailing light. If you select a small aperture these cameras will automatically slow shutter speed so try not to [illegible] stopping the lens right down. When [illegible] the [illegible] [illegible] speed will be faster for the same exposure as any given aperture.

Keep your distance

A [illegible] of compact cameras perform well [illegible] the foreground. The very compact cameras have fixed focus [illegible] of the pictures is a distance between about two metres and infinity. If you have a camera like this it is important to keep within the limits set out in the instruction book. Some will [illegible] automatically, it is simply not possible to get good results if you are any closer to the subject. The only exceptions are fixed focus cameras that have a variable aperture, either entirely automatic exposure systems or by the photographer. [illegible] the smaller the aperture, the smaller [illegible] with extra depth of field that may allow you to move a little closer. This extra [illegible] way is usually only about a quarter of a metre though.

Many [illegible] has distances in feet and metres [illegible]

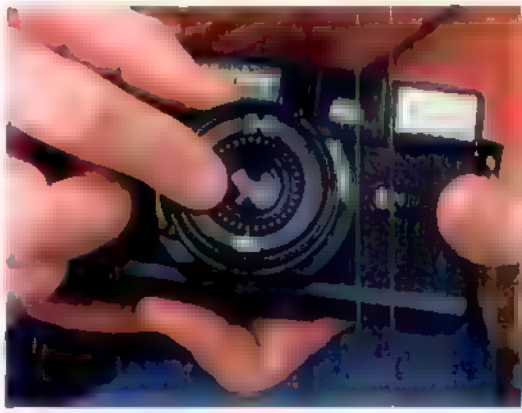
At the zoo *Small subjects usually make disappointing pictures with a compact. Stick to big animals that easily fill the frame and are not obscured by the bars of a cage*

Carry a compact *Make a habit of taking your camera wherever you go—that way you will never miss a picture*

[illegible]

Use the viewfinder properly

[illegible]



Changing ASA *You can compensate for backlighting by changing the film speed —you do not need a special switch*

Unusual lighting needs care

[illegible]

Better composition

[illegible]

Keep your distance *Compact cameras have a limited focusing range, and it is easy to get out of focus results when you are close to your subject. Instead of trying to fill the frame with the subject on its own, move back and add another element to the picture*

George Wright

Simple subjects *Compact cameras give their best results when the subject is not too far away. Pick out uncomplicated scenes without many distracting details*

Check for parallax *If the framing of your pictures is consistently wrong you can use this simple method to check the accuracy of the viewfinder*

Understanding...

The camera computer

Electronics are playing an increasingly important role in modern cameras

Many modern cameras are claimed to be all electronic or computer controlled. Certainly recent years have seen a marked trend away from purely mechanical cameras with only a little electronic assistance such as the photocell of a metering system, to ones with full electronic control and a minimum of mechanical operations.

A significant factor in the progressive reduction in size and cost of the electronic components. This has meant that it has become feasible to be included.

Unfortunately there has also been a trend towards using computer jargon to describe electronic systems. What is not often made clear is that the mechanisms of the equipment have been made increasingly complex in order to make their operation easier. Few photographers are interested in the exact way in which automatic exposure and other electronic functions are achieved, but an acquaintance with the jargon can help to decipher the specifications given by the manufacturers.

Shutter control

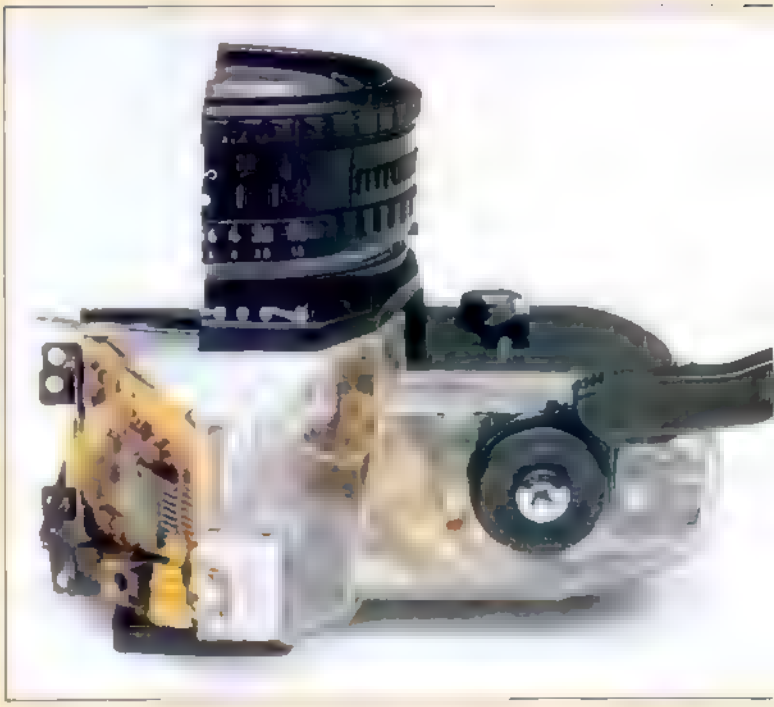
The most common use of electronics is in the timing of the camera shutter, with the actual movement of the shutter blades or leaves remaining mechanical (see page [illegible]). Cheap or fixed and basic point-and-shoot cameras used mechanical timing arrangements of great complexity with numerous moving parts. In electronic cameras these have been replaced by a simple form of electronic timing circuit consisting of a battery which charges a capacitor—a device for temporarily storing current—to a set level. When this level is achieved a two-transistor electronic trigger activates an electromagnet called a solenoid. When actuated the solenoid closes the shutter.

The charging process is started the moment the shutter opens. This means that the time the capacitor takes to reach the correct charge level corresponds to the time the shutter is open, the shutter speed. The time it takes for the capacitor to charge up and so the shutter speed is altered by varying the resistance in the circuit.

Electronic cameras at first used a set of resistors of different values. In manual operation of the shutter speed meaning the dial still simply selected the appropriate resistor but it was soon realized that the camera's already contained a variable resistor—the photocell.

Automatic exposure

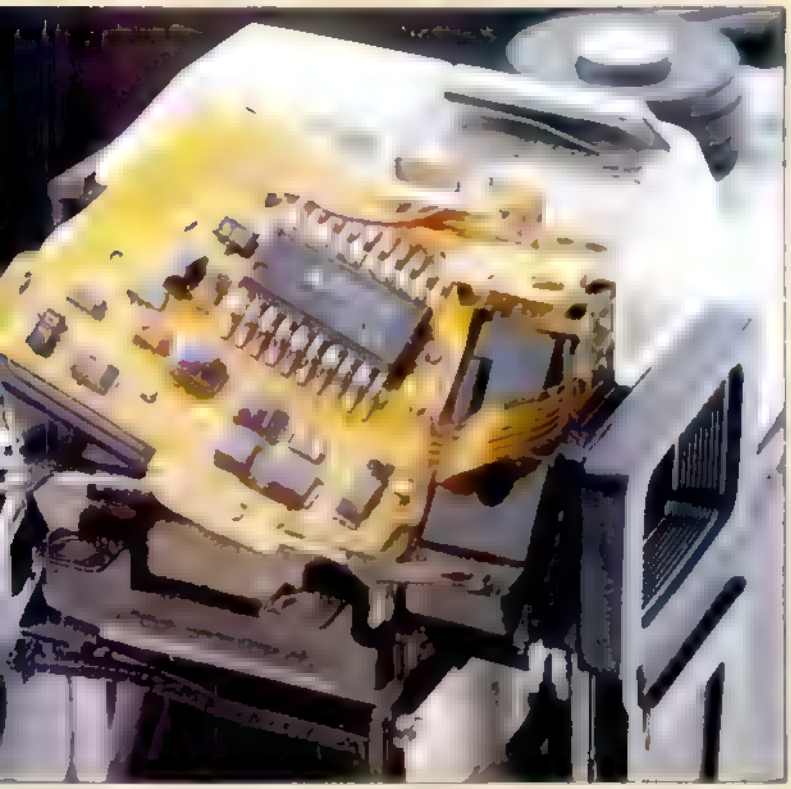
The resistance of the CdS cells which many cameras use (see page [illegible]) varies according to the intensity of light falling on them. By using these cells in the control circuit the shutter is automatically controlled by the metering system in the way.



Mass of circuits *Many mechanical functions have been replaced by electronics*

Aperture control *The curved electric contact registers the selected aperture*

Photographs Dave King, camera courtesy of Nikon UK Ltd



The microcomputer *A large range of features is made possible by the small size of the electronic components*

the shutter speed varies with the light level, giving *aperture priority* automation (see page 200). Using the photocell has the further advantage of giving a continuous rather than stepped range of shutter speeds, since the resistance of the cell is continuously variable

The necessary control circuit for this kind of operation is very simple The principle requirement is a pair of *potentiometers* which are devices for varying voltage One represents film speed, and the other represents the chosen aperture

This basic circuit has been added to considerably as cameras have become more sophisticated. A rearrangement of circuit elements allows shutter priority operation by precise control of the iris (using a solenoid) The CdS cell has, in many cases, been replaced by the *silicon photodiode* (SPD) which needs an additional amplifier to boost its weak signals to useful levels but works much more quickly The fast acting SPD allows off-the-film metering for both ordinary and flash operations —which require extra control circuits

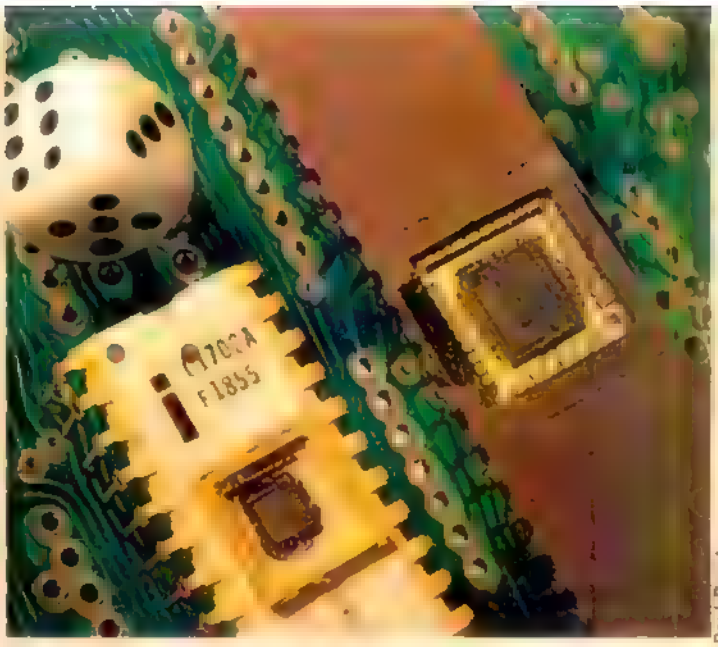
More electronics

There are many other features for which electronic control circuits are used The battery power may need a voltage control, for instance, and, as with many of the circuits, this usually includes a microchip Accurate timing for time exposures is often [illegible] by counting the [illegible] crystal [illegible] But this calls for [illegible] ntrol and counting [illegible] grammed expo- [illegible] ge 203) is also electronically controlled. So is the operation of many motor drives, which must synchronize with the given shutter speed

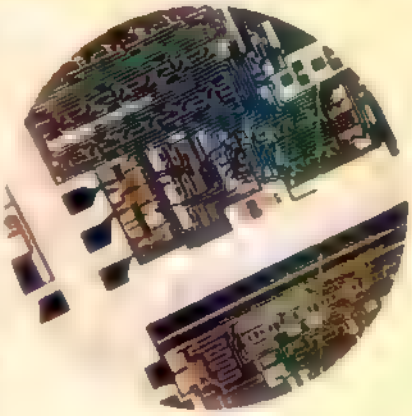
The traditional viewfinder display of needle and pointer has largely been replaced by Light Emitting Diodes (LEDs) and Liquid Crystal Displays (LCDs), or illuminated letters and numbers All this needs additional control circuitry

All this information would be useless if it was represented as levels of electrical resistance or voltage — *analogue data*—and must be translated to a more understandable form. In sophisticated cameras this is converted, by microchips, to *digital* data Digital processing, which uses a microcomputer, employs a special coding method, and can cope with vast amounts of information It requires a special preset *program*—a basic set of instructions—to work through, and a timing circuit to c[illegible]ol the place of each step in the overall sequence

If a large number of circuits is used in a camer[illegible] an extra control is n[illegible] to keep order. This task is carried out by a *Central Pro[illegible]ing Unit* (CPU). This receives input information in digital form about the shutter speed, film speed, aperture settings and meter reading Use of the motor drive, dedicated flash, self tuner and stop down control all register directly with the CPU. After calculations the output is converted fr[illegible] digital form into a form suitable for control of the shutter and iris. The information in the viewfinder is also supplied by the CPU. The full sequence, involving the several hundred calculations needed to synchronize [illegible] operations, takes only a fraction of a second



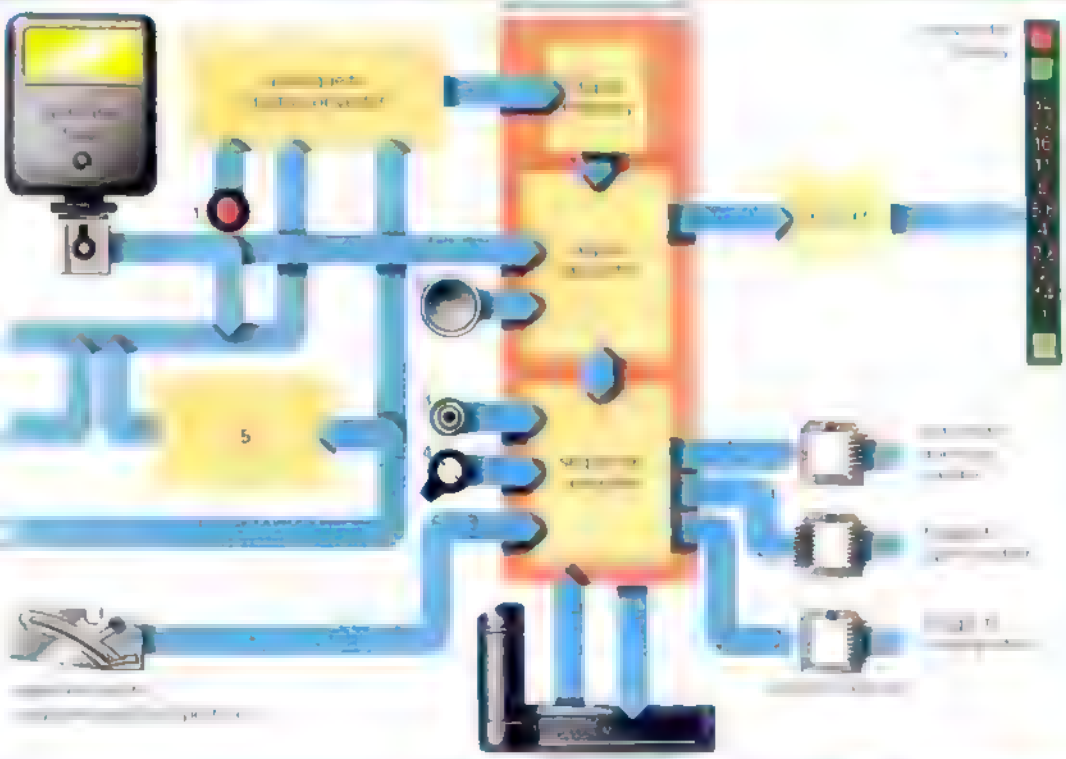
Paul Brierley



Silicon chips *The top shot shows microprocessor memory systems using silicon chips. The leader line (lower) points to part of a chip the thickness of a human hair*

Basic electronic camera system

Channels of information
This circuit layout is typical of modern cameras though many of them have additional features such as sound emitting devices flashing lights, and so on



Creative approach

Using shadows

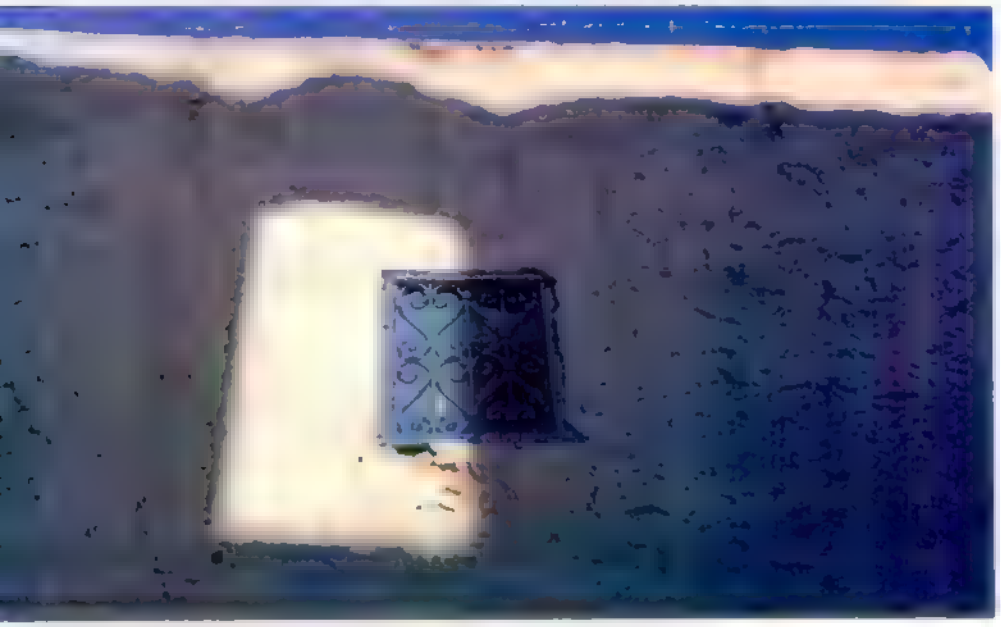
Shadows are a vital element of many photographs, though their importance is often overlooked. With a little thought, you can use shadows creatively to improve many of your shots

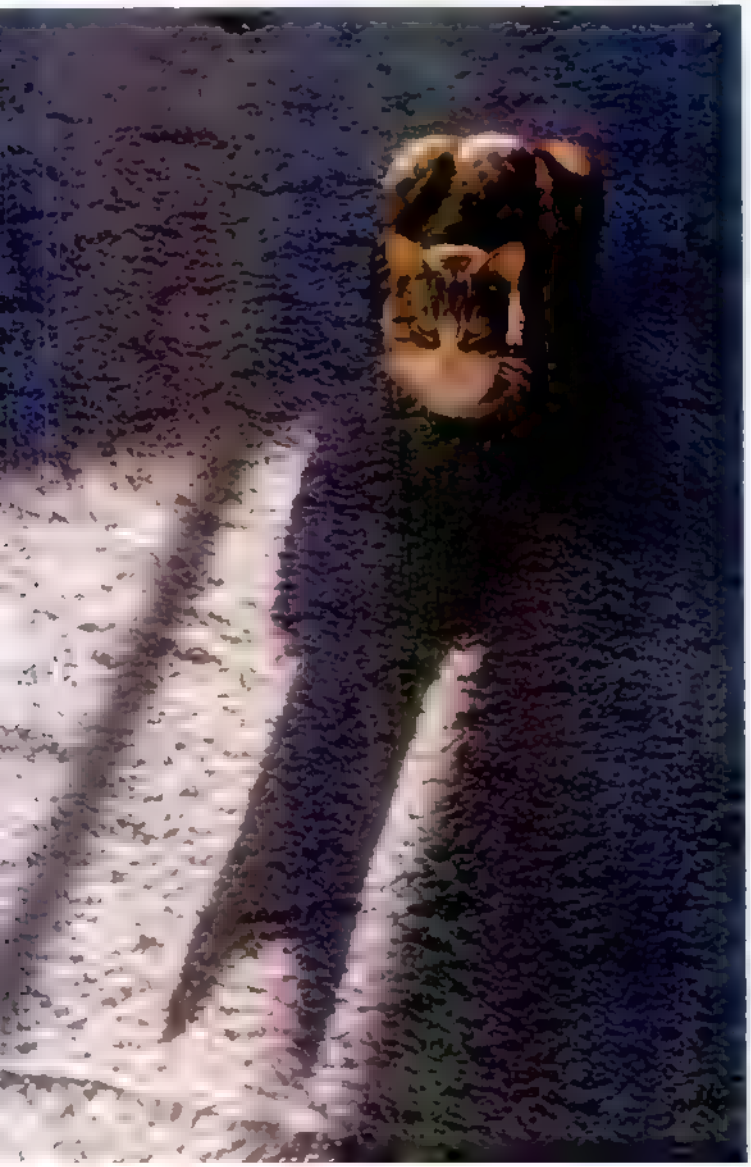
Martin Proctor

Deckchair *If a shadow is strong enough you can use it effectively as the main subject of your picture*

Cat *As shadows begin to lengthen later in the day, look out for extraordinary effects*

Window *A cleverly spotted shadow in bright sunshine where the shadow of an open window overlaps a closed one*

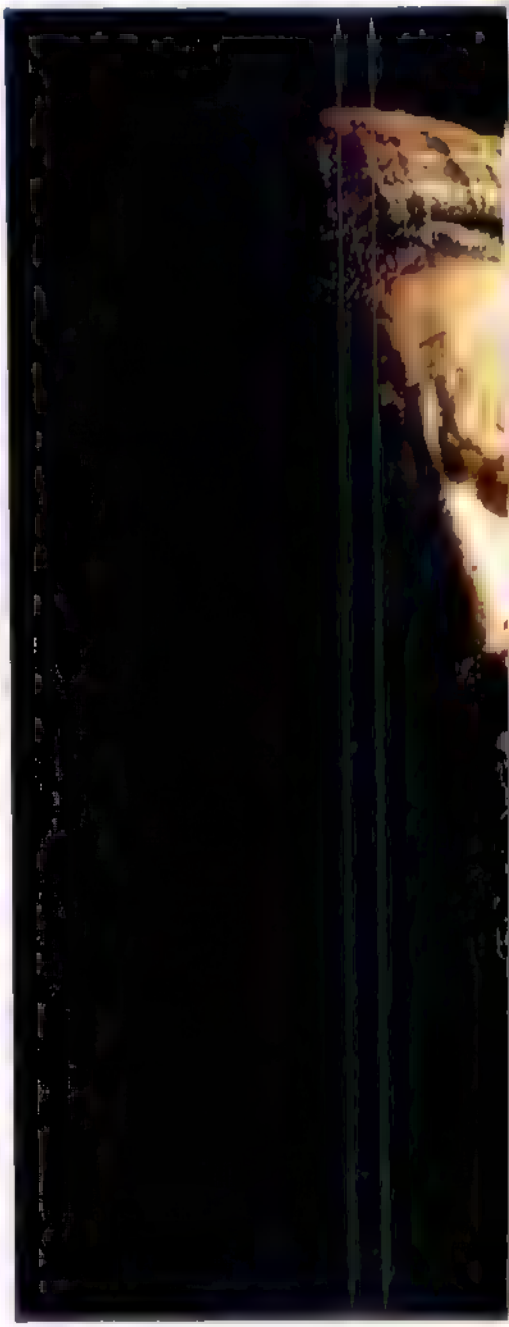


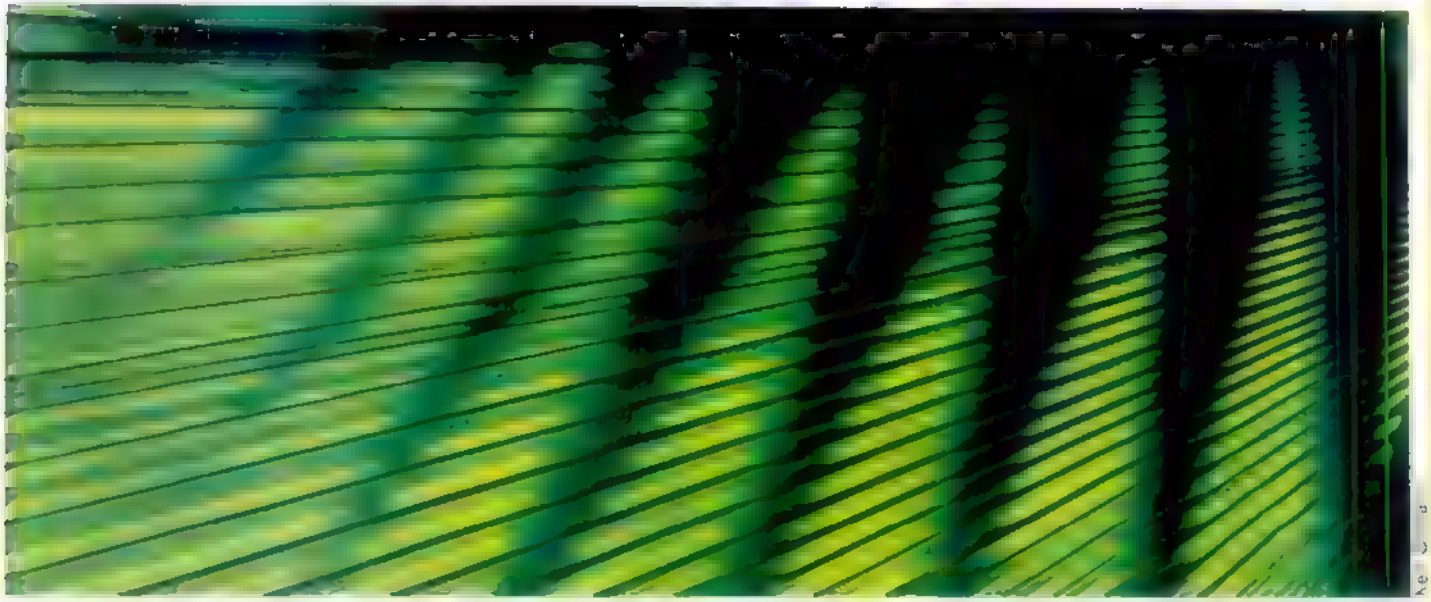


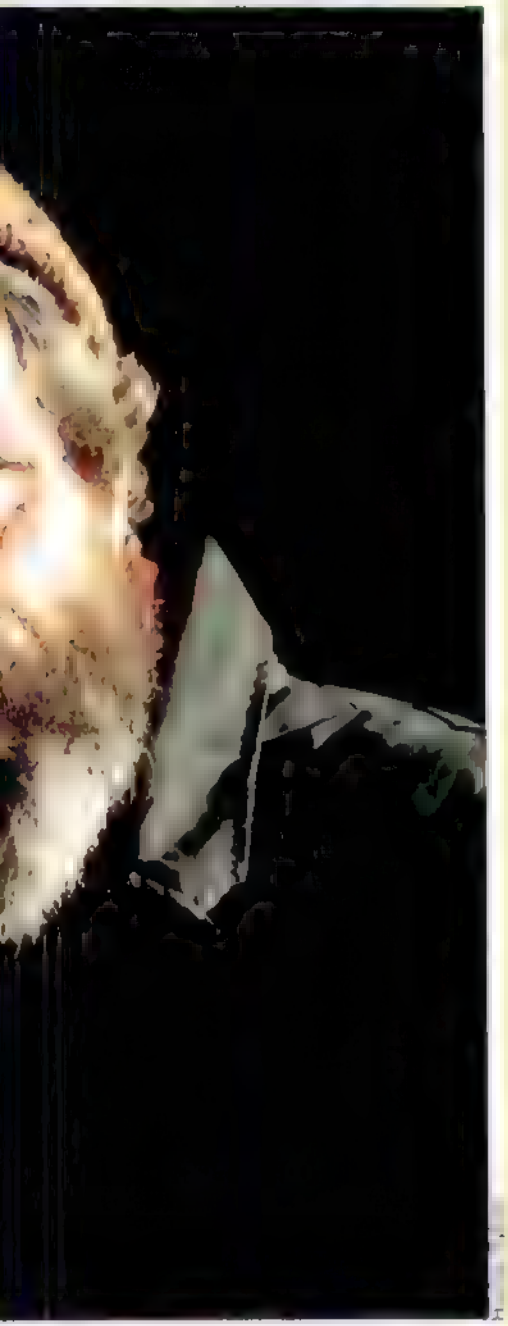
Nets *Delicate objects cast interesting shadows when the sun is at a low angle*

John de Visser

Tractor *Snow gives a clean, clear background for winter shadows like this* **Tree** *The photographer has juxtaposed the real tree on the horizon with the shadow of another which stretches towards it* **Portrait** *A single light source creates a dramatic sense of form, leaving a face which is half in shadow, contrasting strongly with the lit area* **Palm** *Shadows from leaves can make unusual abstract patterns, which are particularly effective when seen against the background of other vegetation* **Red wall** *The shadow of a figure against a brightly coloured wall makes a subject in itself*







Adam Woolfitt: Susan Griggs Agency

Desert *Shadow in this sort of photo emphasizes form and shape, and helps to reveal the pattern as well*
Tower block *You can concentrate on one building as a subject, when a distracting background is in shadow*

[illegible] a car, a flower or plant and use these in your composition. If possible move them around until you have the picture you want. You [illegible] your own images with shadows [illegible] the shadow of a person smoking a cigarette beside a no smoking sign, for example.

Besides using shadows as the main subject, consider including an object's shadow as part of the composition. Take care since a busy ground shadow can easily distract the eye from the main subject. This can be especially annoying when the shadow appears as an unrecognizable blob, but it can be helpful giving an extra information. With a little more thought and careful [illegible] of camera angle and subject position in relation to the light source, busy ground shadows can be used to add something to the main subject. A three-quarter view of a face, for example, might be enhanced by the inclusion of the shadow of a profile outlined on the wall behind. The bars of shadow on a window behind could give some subtlety to a nude study, as well as hint at or accentuate the curves of the body.

Strong directional shadows can play a major part in the design. It is worthwhile if you use them as an element of balance or perspective. In particular look for shadows of people, buildings, trees or plants that stretch across a page in your picture, either helping to emphasize this space, or break it up into separate areas. The strong diagonal and boldly produced by such shadows can be incorporated into the composition to make a powerful abstract image.

Once you are aware through your viewfinder of the possibilities of distinct compositions, you will find that you have the freedom to choose images which bear little or no relation to the subject you are photographing. An ordinary metal fence, for example, seen at a certain time of day, either late in the afternoon or early in the morning, can produce a shadow that not only resembles its true form, but results in an image that is both interesting and abstract.

While many shadows can be used as a representation, however distorted, of a recognizable object, there are other circumstances where the shadows have no particular form. These could particularly show angles of illumination.

As the sun rises lower in the sky the influence of shadow on any [illegible] shape becomes increasingly [illegible]. An ordinary object and its shadow [illegible] can be transformed by a pattern. [illegible]

Road sign *When the sun is low in the sky, shadows of simple objects lengthen and distort*
Pram *A cobbled street makes a good background texture to show off a spectacular shadow in black and white*

shadows later in the evening. Architecture in particular benefits from the modelling that is produced by direct sunlight fairly low in the sky, whether early morning or late afternoon. This light creates shadows which pick out textural details, apart from emphasizing form. Architectural photographers will often not attempt to take a picture while conditions are overcast and no shadows exist. They know that the results will almost certainly be flat and unmodelled. With exterior shots artificial light can be used to create modelling, but with large scale exteriors the only thing to do is to wait for the weather to change.

Areas of shadow are useful when photographing a subject which has an amount of cluttered foreground detail that may be difficult to avoid. For example, you may wish to photograph a newly constructed skyscraper but have found that the immediate foreground area is filled with the remains of building machinery and scaffolding and other rubbish. Choose a time of day when the building is illuminated by strong sunshine but when the foreground falls into deep shadow. This shadow will effectively obscure the distracting details which would otherwise interfere with your subject. Bear in mind, however, how you intend to frame the shot and how the shadow falls on the building. Areas of the building that are in deep shadow will be lost in the shadow. Another example might be a formal portrait session where you have control over your lighting set-up. But where you want to concentrate a particularly distracting background, it may be said that your subject may be wearing a pattern perhaps with to reduce the effect of a strong wallpaper pattern. Choose to have the subject fall in a strong shadow which you can introduce by blocking your principal light source.

Apart from using shadow merely as an element in your composition, it can be used that in itself. An item apparently obscured by deep shadow will, in these conditions, [illegible] extremely and be and then conditions [illegible] which would be impossible to capture by direct light. A portrait taken in bright light will [illegible] harsh features which, by contrast, by simply placing your subject into a shadow area and adjusting your exposure accordingly you will find that these harsh elements of the formal picture have disappeared to be replaced by a [illegible] more subtle lines that will further enhance the portrait.

As well as being important in the creation of [illegible] shadow is chosen in the development of form and can add interest, drama and atmosphere to the composition, whether representational or abstract. Avoid [illegible] times [illegible] and [illegible] where you start [illegible] and [illegible] many [illegible] examples present themselves.

Carrying equipment

The very thought of carrying all your photographic equipment can be daunting enough to make you leave all but the basics at home. Buying a good camera bag or box, however, can make life much easier

While your photographic equipment consists only of a camera and a few filters carrying it presents no problems. But as soon as you begin to add extra lenses, flashguns, light meters and other accessories, a proper carrying bag becomes a necessity unless you are prepared to take only the bare essentials on each assignment. Equipment can be simply flung in a cheap holdall but for adequate protection a proper camera bag is needed. A proper camera bag also makes it easier to locate a particular item in a hurry.

Purpose-made camera bags are of two main types: soft, padded bags and rigid cases. Soft bags are by far the most popular with both amateurs and professionals – except those who do most of their work in studios. Soft bags are usually equipped with [illegible] and are not [illegible] around. Although [illegible] selected a padded bag [illegible] tection, [illegible] they are [illegible] wishes to [illegible] easily with the [illegible] other hand for photographers who work mostly in the studio and carry their equipment between [illegible] the awkwardness and weight of a rigid case [illegible] protection is dearly worth the expense.

Soft bags

Although light synthetic materials [illegible] leather and [illegible] require more [illegible] the range and quality of soft bags on the [illegible]

Bags and cases *There is a huge variety of camera bags and cases to choose from but some are much better than others*

Hard cases *A professional's alloy case is often tough enough for the photographer to stand on if a high viewpoint is needed, and offers better protection than soft bags*

Dave King

[illegible] the [illegible] bag [illegible] provides [illegible] protection.

Cases [illegible] the most [illegible] the quality [illegible] the [illegible] frequently [illegible] better [illegible] quality [illegible] and [illegible] expensive.

Good quality bags are generally made from padded lightweight and durable nylon [illegible]—similar to the material used in the [illegible] a [illegible] quality and [illegible] as [illegible] The outer [illegible] of the more expensive bags are [illegible] layer of [illegible] in between each [illegible] These [illegible] to prevent the bag [illegible] shape [illegible] to [illegible] the bag [illegible] a theory. The better quality bags at the cheaper end [illegible] have a double outer skin but the [illegible] is usually cardboard which loses its stiffness [illegible] after [illegible] use.

Look for a bag [illegible] a [illegible] better [illegible] for the compartment divisions that [illegible] to be [illegible] in the more expensive bags. With the cheaper bags the [illegible] if there [illegible] made of [illegible] covered with [illegible].

The [illegible] the [illegible] very [illegible] In some bags the divisions are fixed and there can be a variety of compartments designed to take specific items of equipment such as cameras and lenses. This can [illegible] disadvantage if your accessories do not quite fit the divisions and the alternative with movable divisions is often less satisfactory. Movable divisions may be altered to suit your equipment—the walls are often attached in each new position with the aid of Velcro strips—but because the divisions must be flexible some items can creep underneath and get lost or damaged.

Many bags also have small pockets on the outside and these can be invaluable allowing easy and rapid access in pressing situations. But these pockets should be well protected by firm fastenings or a flap to ensure that nothing can drop out.

Look for protection in the base of the bag as well. In some of the cheaper bags the bottom is not padded or stiffened at all. This means that if you put the bag down sharply on a hard surface you could be [illegible] damage. The best bags tend to have both padding and stiffening often in a wooden board covered in polyurethane foam. A rigid base not only protects the equipment from dropping but also helps to ensure that the bag does not tend to bend in the middle when carried on the shoulder strap.

Shoulder straps are often a weak point with the cheaper bags and it is worth looking for a bag with a padded section around the strap fastenings. Shoulder straps are generally better than the cross variety and also for a strap that is attached to each side rather than the way round underneath, the bag so that the bag hangs in a circle from the strap. The strap should also [illegible] over the top of the bag and provide the [illegible] point for the handle. If the strap is simply attached to the end of the bag the strain on the bag wall and stitching is excessive. Strapping and handles should be [illegible] and have a [illegible] character part of the bag [illegible] to [illegible].

[illegible] the cost [illegible] not [illegible] the [illegible] features [illegible] to [illegible] how [illegible] has been made [illegible] bag made from the best materials will last [illegible] if it has not been put together properly. Look in particular at the stitching [illegible] the seams apart—if the stitching appears in the [illegible] the stitching is [illegible] and will eventually give. Look also at the zips. They should be tough and smooth running but not loose. Any dust at the end of the zip can cut in rain and should be protected [illegible].

[illegible] vary from bag to bag but only [illegible] be [illegible] any [illegible] but [illegible] a [illegible] of [illegible]. If you [illegible] and [illegible] to visit [illegible] you should [illegible] for a [illegible] bag. [illegible]

Wide straps *It is always worth getting a bag with wide straps as these spread the load and make it more comfortable to carry*

Made to last *A well made camera bag is a work of art. Examine the fabric in detail for the use of quality materials. Look at the stitching, the zip and the way the strap is joined to the bag for signs of good workmanship*

[illegible] outdoors whatever it was that would perforate any normal bag. Impressive claims for weatherproofing have been made for bags such as the American Tourister range, which have been designed for Himalayan mountain expeditions. These have an exterior skin of PVC nylon canvas with a padded solid and inner waterproof liner. The top pulls down tightly over the bag and the bag is sealed with a fabric material and clips so that it is completely weatherproof despite its low weight.

However no soft bag will ever give your equipment complete protection and durability is not important it may be worth paying the extra for a rigid case with a gasket seal.

Rigid cases

Most rigid cases are made from aluminium alloy, although there are some plastic cases on the market. There are two different types of alloy case. The more expensive one is made from two sheets of stress-formed aluminium. The interior is lined with a semi-rigid foam providing better protection than the cheaper soft foam used

Dave King bags courtesy of M. Bingham & Co

for [illegible] with a gasket seal so that when the case is closed it is waterproof and dust proof.

Cheaper cases are a wooden board structure covered in thin metal alloy on the outside with [illegible] and other protection and are lined on the inside with soft waffle foam. This is not deep foam, it needs to be [illegible]. Thus the equipment is [illegible] so that you can [illegible] to fit your equipment. However the [illegible] and you cannot [illegible] easily. Some cases are [illegible] with a [illegible] and a [illegible] suitable for packing your equipment. Unfortunately any new [illegible] will not fit into [illegible].

Any [illegible] protection [illegible] extra [illegible]

Packed for pictures *A well designed camera bag carries a surprising amount of equipment. You can even strap a tripod on to this bag*

Small bag *There is no sense in buying a large bag if you regularly carry only a single camera body and a couple of lenses*

Dave King bag courtesy of Nikon UK Ltd

Many cases are so [illegible] that you could easily pack [illegible] with [illegible]. A case could have you [illegible] the extra height you need [illegible] over the crowd. The extra height could also be useful if you have a wide lens camera and want to have shots without getting [illegible] heads.

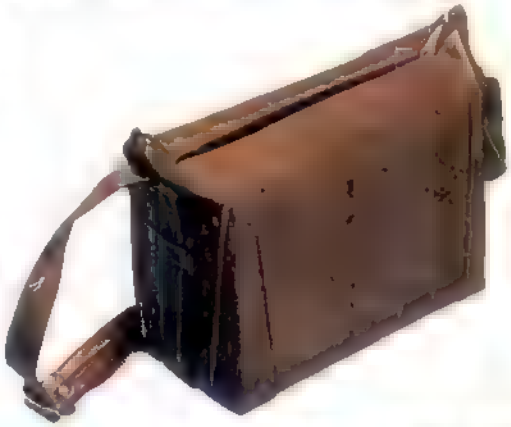
Although bags are made from plastic [illegible] cotton, they are [illegible] tough and can be lighter than many types. You can find cotton [illegible] made for the office [illegible] which are actually identical to the [illegible] and for photographers. The latter may [illegible] for less than the cost of the photographic version. The difference is that the photographic cases have side fittings for a shoulder strap and the office cases only have a carry handle.

Lightweight bag *Inexpensive bags are worth buying if your equipment is minimal*

Large bag *Some professional camera bags are as large as a holdall. This one has clip on pockets for carrying extra equipment*

Which size ?

Once you have decided which type of bag to buy, you must decide what size you need. Obviously it is [illegible] to buy a bag that can only take the equipment you have at the time of purchase but an [illegible] bag that only just can [illegible] a mistake. A compromise is necessary. If the case of bags [illegible] particular [illegible] particular [illegible] the [illegible] you are likely to want to leave the bag in the camera body when it is in the bag.



Assignment

Wimbledon

Tennis tournaments allow spectators to get almost as close to the action as the professionals. With the right equipment and technique exciting pictures are within the grasp of the amateur photographer

Photographs by Leo Mason

To look at some of the problems involved in photographing a major tennis tournament we look in this assignment at the work of Leo Mason—a highly acclaimed sports photographer who works on a wide range of events but specializes in tennis. Like other professionals, he has the advantages of years of experience of using press viewpoints, contacts and the best equipment available. Often, however, the advantages that professionals enjoy are slightly overstated and amateurs who are prepared to make extra effort find that they can work from as strong a position as many professionals.

To get a good view of tennis action try to get seats as close as possible to the photographers' enclosure. This is seen in the photograph of Platform B at Wimbledon where one public seating area is directly behind the press enclosure. Certainly a distance of even one metre can make a large difference with the viewpoint but this can usually be made up by choosing your lenses carefully.

In terms of equipment often the main difference between the lenses that amateur and professional use is that the professionals have faster equivalents of the same focal length. Great shots can be taken with the slower lenses and if you want the extra speed you can always hire the best lenses available. If you do hire equipment, make sure that you familiarize yourself with it thoroughly beforehand.

Even though Leo [illegible] of the best equipment he does not burden himself unnecessarily. 'I always travel fairly light because of the problems of getting [illegible] and because of the lack of space. [illegible] film type he uses during a two week tournament was governed by the weather. He took Ektachrome 200 and [illegible] ASA for overcast conditions and Kodachrome 64 for the bright sunny days.

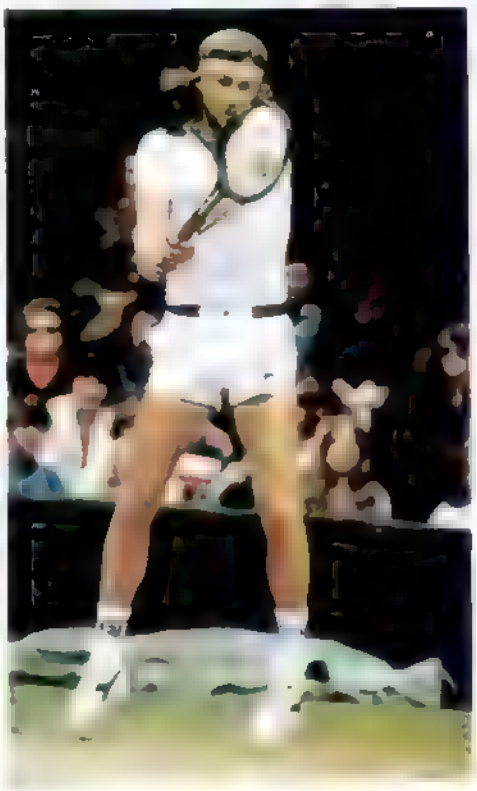
His lenses [illegible] a 16 mm full frame fisheye [illegible] for general views [illegible] for portraits of the players and [illegible] shots [illegible] The [illegible]

Platform B *Although this position on Centre Court is reserved for the press those sitting nearby in the crowd get a very similar view of the game*

Vijay Amritraj *Leo is always on the look out for the interesting angle Shots without action can often capture the mood of the player better*

Wimbledon *For this view of the outer courts, Leo used a 16 mm fisheye and a Nikon F2 The sky was fairly overcast so he used Ektachrome*

Action *Leo found Bjorn Borg and John McEnroe two of the most difficult players to photograph Their play was so perfect that getting interesting shots of them struggling for the ball was almost impossible Both of these shots were taken with the 300 mm—Borg is on Ektachrome while McEnroe and Fleming are on Kodachrome*



[illegible] often [illegible] with a [illegible] converter. With the combination he always uses a [illegible] for [illegible]

[illegible] when to change lenses is partly a matter of experience and partly instinctive, he said. He studies the style of each player [illegible] and when [illegible] every [illegible] but he [illegible] prepared for the unexpected.

[illegible] at Wimbledon was very [illegible] performance [illegible]

Number One Courts. In the [illegible] afternoon and evening the low sun threw shadows across large areas of the courts, [illegible] severe problems for the photographer trying to follow the action.

[illegible] a number of points of advice for amateur covering an event like Wimbledon for the first time. First two camera bodies are essential, with wide angle [illegible] and perhaps [illegible] to fit them. You should have a variety of lenses of different speeds for [illegible] and motor drives. Avoid any distract the players during the game. When [illegible] a shot wait until the [illegible] in the viewfinder. [illegible] not become obsessed with getting the ball in the shot. This used to be considered important but he thinks that it is less so now.

The best position in the crowd, he feels, is towards the centre of the court. You should be prepared to arrive early and wait for the position you want.

Finally, you have to be prepared to take instant decisions when deciding on the best type of shot with whatever lens you anticipated to have fitted. A lot of things happen so quickly that you don't have an awful lot of time to spend going through the niceties of photography.

Jimmy Connors *Leo always used maximum aperture whenever possible. This limited the depth of field and enabled him to draw out the subject from even the most distracting backgrounds. This shot was taken on Ektachrome with the 300 mm lens and 1.4 converter.* **Chris Evert Lloyd** *in action on a beautifully sidelit on Number One Court. Kodachrome film was used with a 180 mm lens.* **Tears** *The emotion of Wimbledon captured on a 135 mm lens—Sylvia Hanika after losing in the first round.* **Ball boy** *An original shot on Ektachrome with the 300 mm and converter.* **The Victor** *A rare smile on the face of the 1981 champion John McEnroe—Ektachrome 200 and 135 mm.* **Bjorn Borg** *adjusts his wristband—Ektachrome with the 300 mm.* **Downcourt** *The 35 mm catches McEnroe and Fawley bowing to the Royal box.* **Change over** *Tracey Austin polishes her nails to take her mind off the match—180 mm lens.*

Processing colour slides

No colour print can approach the brilliance and contrast range of a transparency. With a little time and care, you can process your own reversal films easily and cheaply

Processing colour slide film can be one of the most satisfying of all darkroom activities. It leads directly to beautiful finished photographs of the highest quality, and yet is quite within the capabilities of anyone who is prepared to work carefully

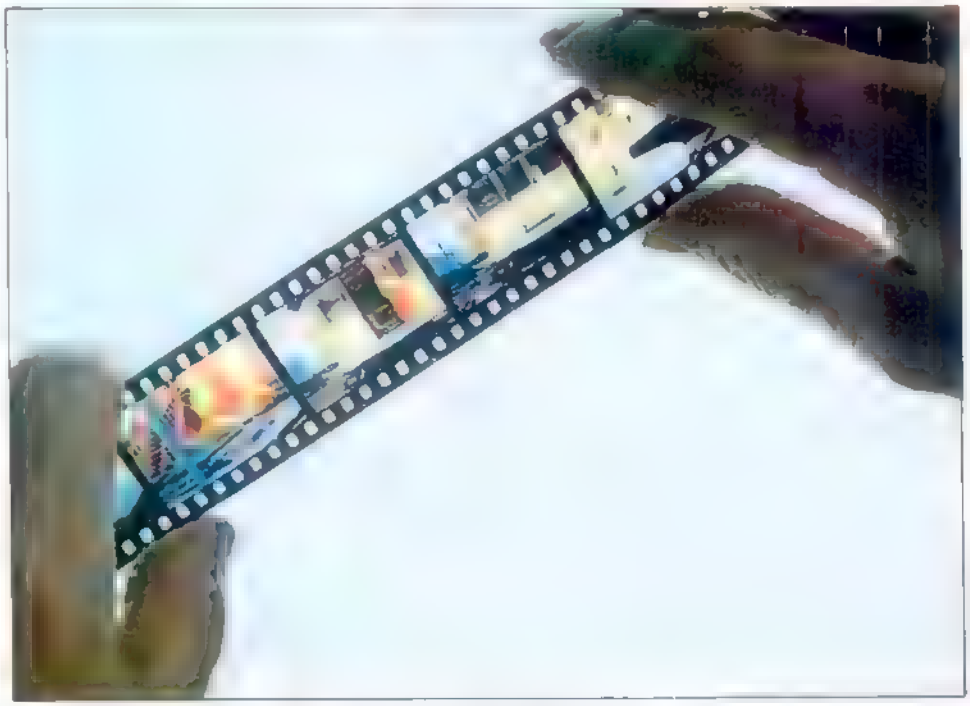
There is no quicker way of seeing the results of your colour photography other than using an instant camera with all its limitations. You can be projecting top quality slides within an hour or so of taking the pictures, without sacrificing the film's performance

There are two slide proc[illegible] able for home use One is matc[illegible] the Kodak Ektachrome syste[illegible] the Ektachrome Process [illegible] (which is shortened, simply, to 'E-6') The other is matched to the Agfachr[illegible] system and is called Process 41, or P41

You can process any E-6 compatible film using either Kodak's own E-6 process kit or the E-6 kits from independent manufacturers, of which there are several. Suitable E-6 films include the Ektachromes, Fujichrome and a number of 'own label' brands If you are in any doubt, check the processing instructions which accompany [illegible] carton for mention of E-6. You cannot, for example, process Kodachrome, or films intended for E-4 processing

The P41 process is used for Agfachrome type films. The choice of films varies from country to country but the true Agfachrome (50L, 50S and 100 Professional) are widely available

Each system has its pros and cons You might find that one process gives more faithful colour rendering, or that it produces more brilliant, saturated colours. Agfa takes longer to proc[illegible] but the E-6 process requires high[illegible] temperature needing careful control Even with E-6, a water bath is usually adequate for maintaining the [illegible] temperature, but for complet[illegible] a processing machine has se[illegible] Not only [illegible] constant, but it agitate[illegible] taking the drudgery out of the job, and guarantees absolute consistency



David Robinson

Better colour *A transparency is viewed by transmitted light, and shows more brilliant colours than a print*

The E-6 process

The latent image, recorded in the three emulsion layers of the film is developed in complete darkness by the first developer. This produces a negative image composed of metallic silver which is similar to an ordinary black and white negative (see page 578). The action of this developer, however, is much more sophisticated than that of an ordinary developer. Ultimately, it is responsible for the overall density of the image as well as governing the formation and reproduction of its colours. It is the single most important stage in the whole process—and one of only two where time and temperature are critical factors

The standard processing temperature for E-6 is 38°C, with a maximum leeway during first development of plus or minus 0 3°C. The normal first development time is six minutes using the Kodak chemicals. All the usual precautions over time, temperature and agitation must be taken to prevent unintentional over-or underdevelopment

A brief two to three minute wash follows first development. You can use several changes of rinse water at between 33 C and 39°C if running water at this temperature is not available. You may use spare water from a water bath for this job, but it must be clean

The wash removes excess developer and so prevents the development from continuing The next stage is a reversal bath of two to three minutes duration again using solution at a temperature of between 33 C and 39°C In the reversal bath the emulsion becomes laden with a potentially active reversal agent. This activity is triggered by the colour developer which follows. Fogging centres form on all the silver halides which were left unexposed by the camera exposure, and were therefore left untouched by the first developer. This is an essential part of the colour formation phase, and it is important not to give less than a minimum time in this [illegible]

It is safe at this stage for you to open the processing tank and continue with the remaining [illegible] You may find it le[illegible] to continue with the film safely contained within its tank The film now looks like a very dense but unfixed black and white negative film

[illegible] which is [illegible] converted to a dye [illegible] 0 6°C. The duration of [illegible] between six and eight min[illegible] sure that the colour [illegible] quickly, agitate the ta[illegible] the first half minute

Colour couplers contained within the three emulsion layers react with the colour developer to produce the yellow component in one layer, the magenta component in another, and the cyan component in the third [illegible] formed only in those [illegible] metallic silver forme[illegible] velopment

If you look at the [illegible] there is no sign of colour—all you see is dense black because the image dye[illegible] still covered by [illegible] function of su[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

film for about four minutes using running water within the process temperature range. Use a succession of individual rinses if this is more convenient.

An optional but recommended final step is to immerse the film in stabilizer and re-hanging it up to dry in a suitable dust-free position.

Uprating with E-6

By making small adjustments to the first development period it is possible to obtain acceptable transparencies from films which have been exposed at ratings other than normal film speed ratings. While this is true for all user-processed slide films, Ektachrome type films respond particularly well to this treatment. There is inevitably a loss of picture quality but this is usually tolerable if the only alternative would have been not taking the pictures.

A film knowingly underexposed by one stop – that is exposed as if it were a [illegible] faster film – can be rescued by increasing first development time by [illegible] minutes. Correcting for underexposure requires increasing the time by two stops, one for each stop of underexposure. By a further minute and a half. The same correction in the case of overexposure is about one stop, achieved by reducing the first development to four minutes.

In conjunction with the faster film, increased first development time will yield some appreciable fast speeds which are very useful for various fields of photography where low light possesses problems. If you intend to uprate your film for work of this kind, it is a series of test exposures and try out various first development times before committing yourself.

Agfachrome processing

The Agfa P41 process differs from the E-6 process in one important respect. Whereas chemical reversal is achieved entirely by chemical means in the E-6 process, in the P41 process the film has to be re-exposed to white light at a point between the first development and colour development stages. This is done simply enough by removing the film from the processing tank and exposing it to a suitable light source. The subsequent processing stages may continue outside the tank if this is more convenient.

The duration of this second exposure depends on the strength of the light you use and its distance from the film. It must be sufficient to fog all the unused silver halides which remain in the film after first development. If the lamp you use is sufficiently bright you should need to remove the film from the tank. A 15 watt bulb is ideal. Remove the spool from the tank and expose each side for about a minute at a distance of about [illegible] from the bulb. Be careful not to splash the hot lamp as the bulb may

1 Pour measured amounts of solutions into bottles and place them in the water bath or processing machine

2 Set the right temperature on the machine, or fill the water bath with water at the process temperature

3 Check the temperature of the water bath. A machine may take some time to reach the correct heat

4 Pour the first developer into the tank. If using a machine, quickly place the tank in its revolving mount

5 Agitate the tank during the development time. Drain the developer and rinse the film ready for reversal

6 With the E-6 process, pour in the reversal bath. Rinse, pour in colour developer and wash, ready for bleaching

7 With the P41 process, re-expose the film as shown. Replace it in the tank, give colour development and wash

8 Pour in bleach, rinse, fix and wash as instructed. Some kits combine bleach and fix, eliminating one stage

Jon Bouchier

shatter If you use a more powerful bulb, keep the film far enough away to avoid scorching the film.

A stainless steel spiral cuts out too much of the light, so if you are using one of these, first remove the film. Do this carefully so you do not damage the emulsion which is very delicate when wet For short lengths, hold the film taut, an end in each hand, and seesaw the film past the lamp Make sure every part of the film receives at least a minute's exposure and, to be on the safe side, expose both sides of the film

This technique can prove difficult for long lengths of film and a useful way to get around the problem is to unspool the film carefully into a white bowl containing water at, or near, the correct process temperature. Point the lamp into the bowl and give a two minute exposure, rotating the bowl so that every part of the film receives sufficient exposure Afterwards, place the spiral in the bowl and carefully respool the film—you will find it safer, and easier, to do this under water

This method has certain advantages and it is therefore worth adopting even when you are using a plastic spiral. The water protects the film from excessive lamp heat, and the bowl ensures all-round exposure Simply place the loaded spiral flat within the bowl and expose each side in turn—again, for about a minute at 30 cm from a 150 W bulb

Because of the varying colour output of different types of tube, fluorescent lighting is not always suitable for the fogging exposure So use only tungsten lighting—or even daylight if a bright enough bulb is not available—to make sure that the colour balance of the film is not put at risk

Whatever form of lighting you use, make a point of giving more exposure if you are in any doubt. Excessive re-exposure has little effect on final results —in fact all remaining processing stages may be carried out in full lighting, as in the case of the E-6 process

In other respects, the Agfa P41 process broadly resembles the E-6 process, but it does not normally end with a stabilizer bath, in common with some of the independent E-6 process kits. Two process temperatures—20°C or 24°C—may be used, the lower one being suitable where temperature control may present problems. The whole P41 process, which includes more intermediate (washing) stages than the E-6 process, is particularly lengthy and this point should be considered when planning your working methods

Uprating Agfachromes

The Agfachromes can be processed to correct for small errors in exposure. As for Ektachromes in the E-6 process, this is done by making small adjustments to the first development time. Although it is best to establish your own times, by trial and error, for future adjustments to the standard Agfachrome film speeds, as a guide you can correct underexposure and overexposure of about one stop by lengthening or shortening first development by 20 per cent This would mean, for example, increasing the normal first development time of 13½ minutes (in the 24°C process) to 16 minutes to correct for a known case of one stop underexposure—or shortening it to 11 minutes in the case of one stop overexposure. Fractional corrections can also be made—a half stop exposure error can be corrected by a 10 per cent change in first development

Changes to first development do not affect the relative grades of contrast within a picture, but any increase of first development reduces the density of the darkest, least exposed areas of the film. Up to about a one stop correction has little significant effect on the colour quality of the image It is possible, however, to raise film speeds beyond this point by making substantial changes to the first development time. If you can accept the inevitable loss of colour quality, such uprating techniques offer some intriguing possibilities, which are discussed fully in a subsequent article

Capacity and storage

For consistent results you should always use fresh solution, but for maximum economy you can process several films more than recommended with a given amount Beyond a certain point, however, quality of results inevitably suffers. Kits contain detailed instructions for re-using solution. Follow them closely when mixing chemicals, and always wear gloves, because some can cause skin irritation. Keep chemicals in clearly labelled bottles, out of harm's way, and only mix up what you need, because developer solutions do not keep well.

Colour slide film processing

Processing stages	Kodak Ektachrome Process E-6		Photocolor Chrome-Six		Unicolor E-6		Agfachrome P41 at 20/C		Agfachrome P41 at 24/C	
	Time mins	Temp C	Time mins	Temp C	Time mins	Temp C	Time mins	Temp C	Time mins	Temp C
Preheat	–		1	43	1	40 6	–	–		
First developer	6	38 0 3	6½	38	6½	40 6	19	20 0 2	13½	24 0 2
Wash	1½–3	33–39	2	34 42	2 3	40 6	¼	14 20	¼	20 24
Stop bath	–		–	–	–	–	4	18 20	3	22 24
A remaining process may be carried out in normal lighting										
Wash	–		–	–	–	–	10	14–20	7	20 24
Reversal bath	1½ 3	33–39	2	34–42	2	40 6	–	–	–	
Re-exposure	–	–	–	–	–	–	see footnote		see footnote	
Colour developer	6 8	38 0 6	6	38	6	40 6	14	20 0 5	11	24 0 2
Condit oner	1½ 3		–	–	–	–	–	–	–	–
Stop bath		–	–	–	1–2	32–43	–	–	–	
Wash	–		1	34 42	2–3	32–34	20	14 20	14	20 24
Bleach	6 8	33–39	–	–	3–4	32–43	5	18 20	4	22 24
Wash	–		–			–	5	14 20	4	20 24
Fix	3–6	33–39	–	–	2–3	32–43	5	18 20	4	22 24
Bleach Fix	–	–	8	34 42	–	–	–		–	
Wash	1½ 4	33 39	4	34 42	2 3	32 43	10	14 20	7	20–24
Stabil zer	½ 3	33–39		–	1 ½			–	–	
Dry						Ambient Below 60				
Total time (ex dry)	27½ 44 minutes		30½ minutes		28 34½ minutes		93¼ minutes		68¼ minutes	

Notes: a) For the re-exposure of Agfachrome hold film 30 cm from 100/150W bulb for one minute each side
b) Another widely available E-6 kit is Tetenal's UK6 Use and times are almost identical to standard E 6

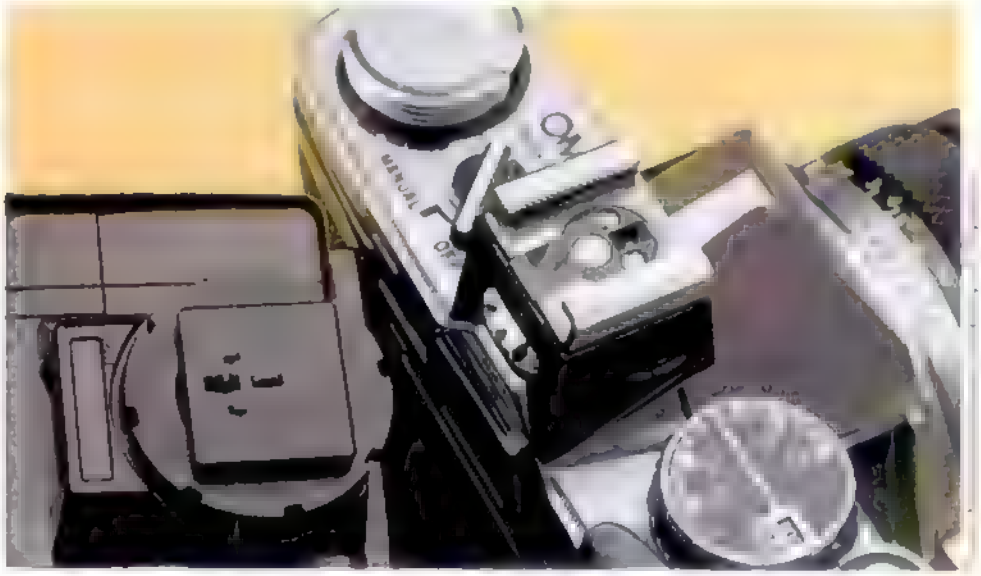
Dedicated flash

If your flash pictures repeatedly show faults arising from simple mistakes, using a dedicated flash may solve your problems. These automatically set the correct speed and, often, the correct aperture

What can a dedicated flash do?

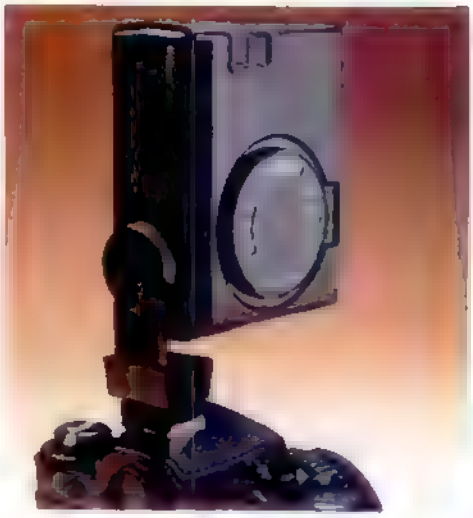
Dedicated flashes *Most [illegible] with electronic exposure [illegible]*

Hot shoe and connection *The [illegible]*



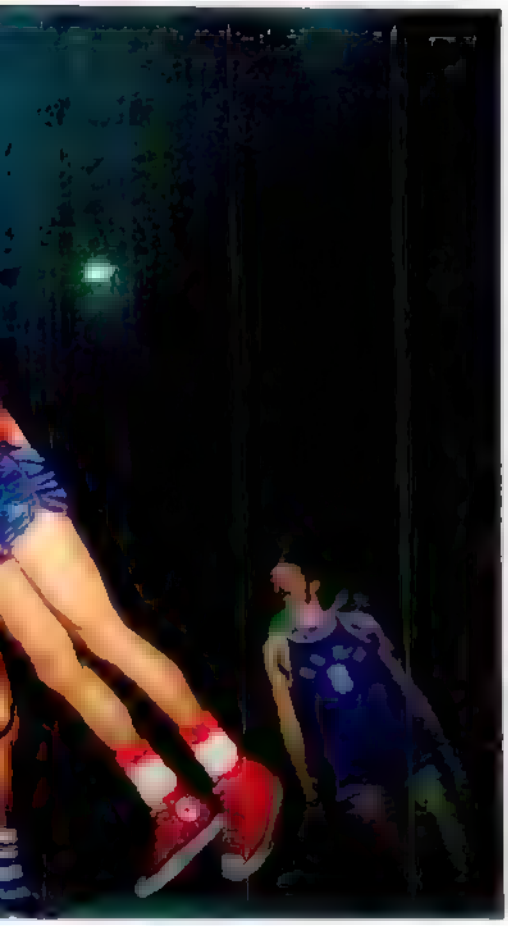
Independent dedicated guns

Olympus T32 *You can use the T32 as an*



Nikon Speedlite *This unit is dedicated*

Versatile gun



Quick snaps [illegible]

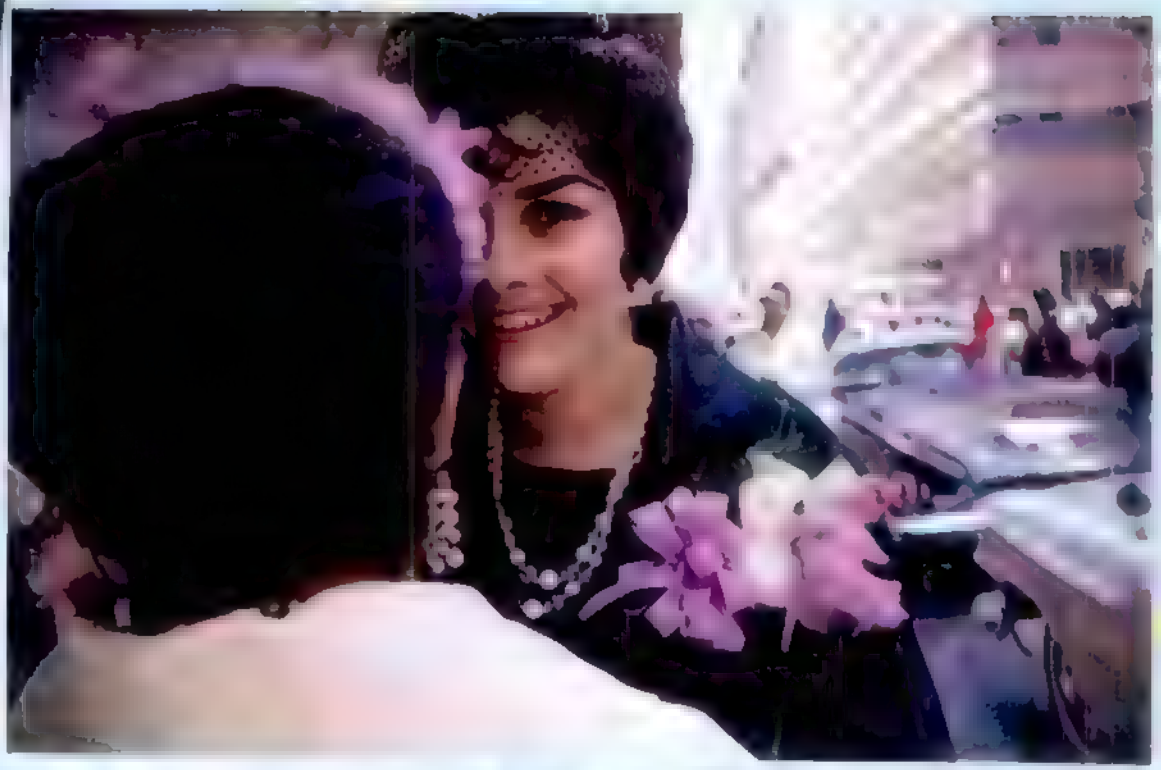
Disadvantages of dedicated flash

Flash systems

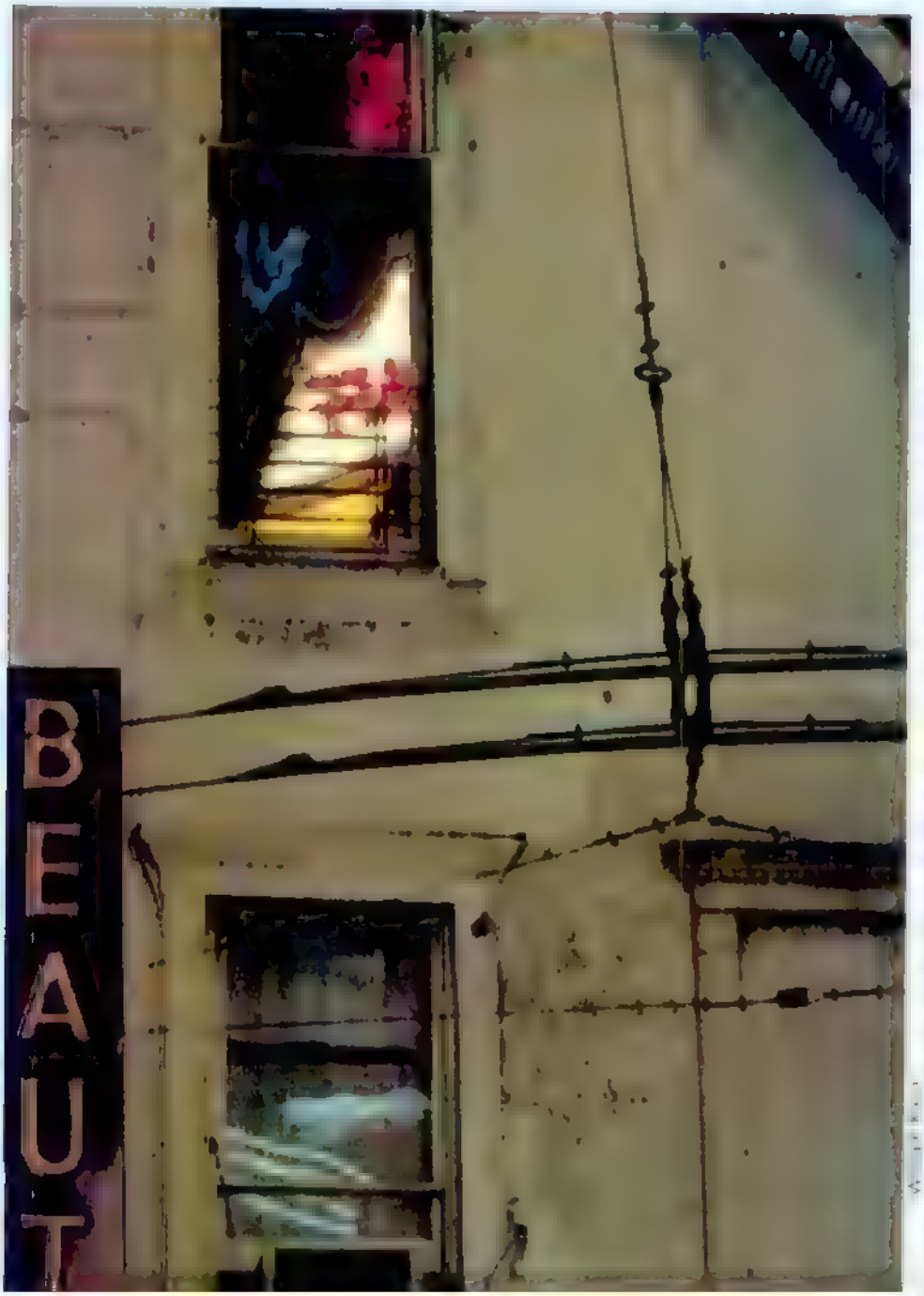
William Klein

By approaching photography in a completely new way, Klein has been a major influence not only on the work of many photographers but also on the way in which photographic books have been presented

William Klein *[illegible]*



Puerto Rican women *[illegible] as they chatter on a sidewalk in New York.* **The smiling face in New York** *transmutes a hair room sign (left) and the* **derelict street** *scene next to it. A city parlour sign (below) are both characteristic of Klein's use of strong graphic elements in many of his pictures to introduce irony and a sense of the absurd. Such elements were used to great effect in his first book, New York*



Spectators *at the funeral of Marcel Thorez, head of the French Communist Party, in Paris, 1964 (left), caught unawares in remarkable range of expressions.* **A forgotten car** *waits forlornly for its owner in a Los Angeles car lot (above). A more recent reflection of Klein's continuing preoccupation with the urban wilderness.* **Independence day parade** *(below) in Dakar, Senegal. Young women march through the streets in a riot of colour as horsemen look on.*


KILL
IRAN'S
FOREIGN
MINISTER


CHESTERFIELD
BEST FOR YOU

Young New Yorker [illegible]

[illegible] **Soho street scene** [illegible]

Understanding...

Lens faults

No lens is perfect. Even complex lenses can suffer from a variety of faults which affect the image in different ways

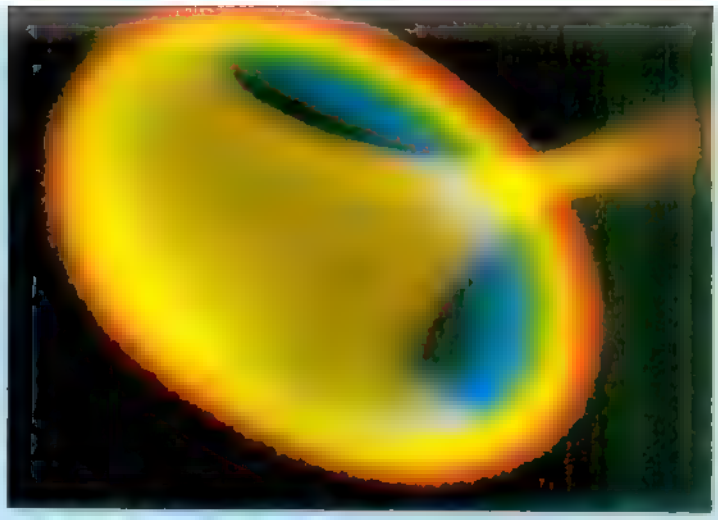
[illegible]

[illegible] aberration is referred to as distortion. [illegible] affect the centre of the image [illegible] towards the edges this is called off-axis aberration. With [illegible] lens design [illegible] these aberrations can be reduced to a minimum but there are always some residual effects.

Lens shape

[illegible]

Sharp centre *Only the centre of the picture is sharp due to shallow depth of field and slight field curvature*



Point of light *Both coma and chromatic aberration affect this image*

[illegible]

changed. A symmetrical design, such as the rapid rectilinear, avoids distortion. It does this by combining a front lens group, which has pincushion distortion, with a rear group which has barrel distortion

When a lens suffers from astigmatism it is impossible to focus a point in the scene into anything but one of two straight lines at right angles to each other. This is because rays of light converging vertically come to focus a different distance from the lens to rays converging horizontally So when vertical rays of light are focused, horizontal rays are still a little spread out—or have spread out again beyond their focus—and this spread of horizontal rays registers as a horizontal straight line If, on the other hand, the lens is focused at the point where horizontal rays converge, the vertical rays are spread out and register as a vertical straight line The best compromise is to focus midway between the vertical and horizontal foci so that a point in the scene registers as a small circular patch—the perfect 'point' image is unattainable

One other important aberration is caused by the fact that a curved lens is used to project an image on to a flat film surface. The image of a flat subject, formed by a simple lens, is saucer shaped. This effect is known as *Petzval curvature*. If no correction were made, the centre of the image would be sharp, while the outer edges would be out of focus—or vice versa. Correction is made by using a mixture of negative and positive elements to force this natural curvature into a flat surface, or flat field, much more suited to a film gate.

All aberrations caused by the shape of the lens can occur with light of a single colour and wavelength but normal 'white' light consists of many different colours and wavelengths, and the different ways in which different colours of lights are refracted produces another range of aberrations.

Chromatic aberration

When white light passes through a simple lens, short blue wavelengths are refracted slightly more than long red wavelengths and the light is dispersed into a spectrum (see page 2[illegible]). This produces chromatic or [illegible] aberration

Axial chromatic aberration [illegible] because blue light [illegible] to focus nearer to the lens than red light—green light is focused midway between. The lens, therefore, has a different focal length for each colour and it is impossible to focus one without the others being out of focus and giving colour fringes.

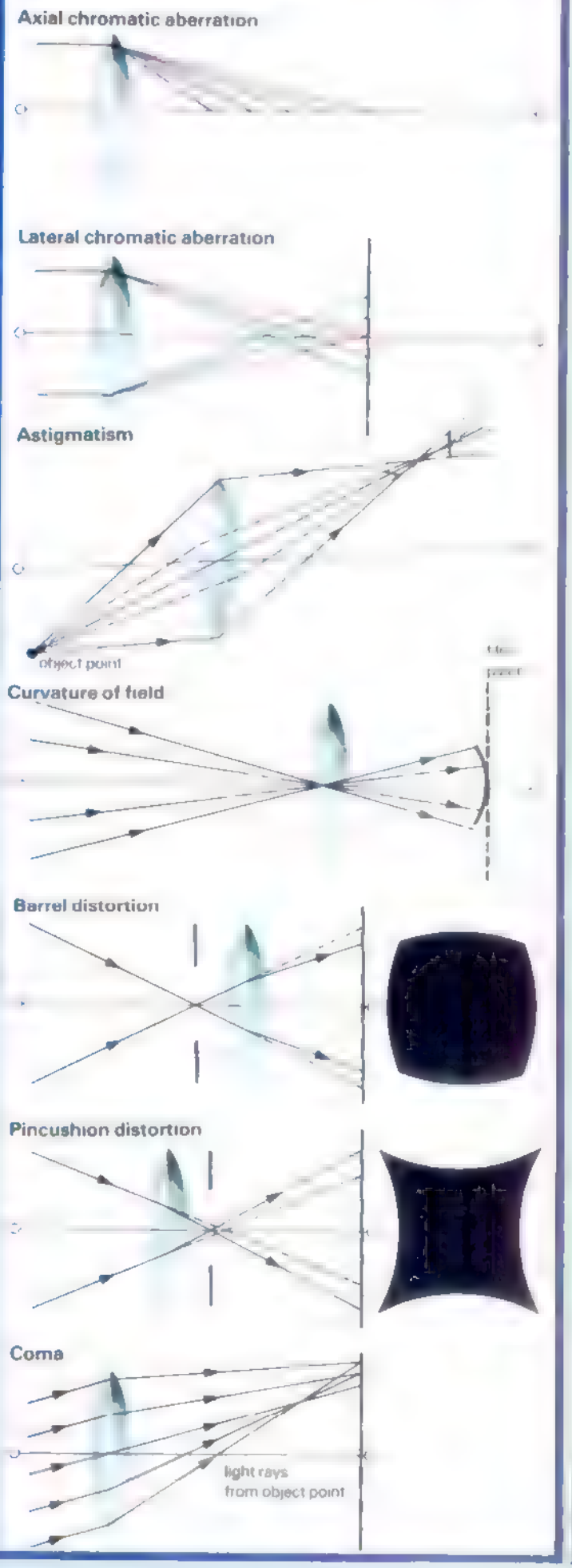
The aberration can be reduced by stopping down to give a greater depth of field, but the best correction is made by combining the main lens with a diverging element which cancels the effect. This diverging element must be made from a different type of glass, so that the aberration is corrected but the combination remains convergent. Unfortunately, a different element is needed to correct for each colour of light.

An achromatic lens has two types of glass and is corrected so that green and blue—two colours—usually focus at the same point, with the other colours slightly out. An apochromatic lens includes at least three different glasses and is corrected for three wavelengths—red, green and blue. With both these lenses, a separate focusing index is needed for infrared, though a superachromat is corrected for this as well.

Even if axial chromatic aberration is corrected by using mutually cancelling lens elements, the different focal length for each colour may still cause transverse chromatic aberration of light falling obliquely on the lens. Because each colour has a different focal length, the size of the image projected by each colour is slightly different. In a lens suffering from transverse chromatic aberration the red part of the image of a white subject is therefore slightly larger than the blue image. The effect is to produce more and more pronounced colour fringes towards the edge of the picture area

Transverse chromatic aberration can often be very obvious and it sets a limit to the performance of long focus lenses although low dispersion (ED) glass or fluorite elements can significantly reduce its effects.

Types of aberration

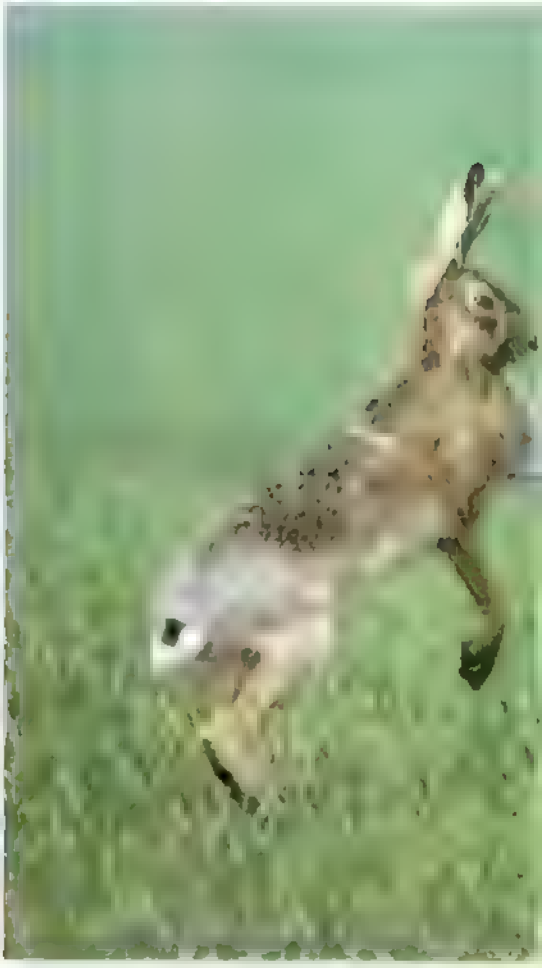


Wildlife

It is more exciting and rewarding to photograph wildlife in its natural setting than in captivity, but locating your subjects and getting close enough to shoot requires some thought and practice

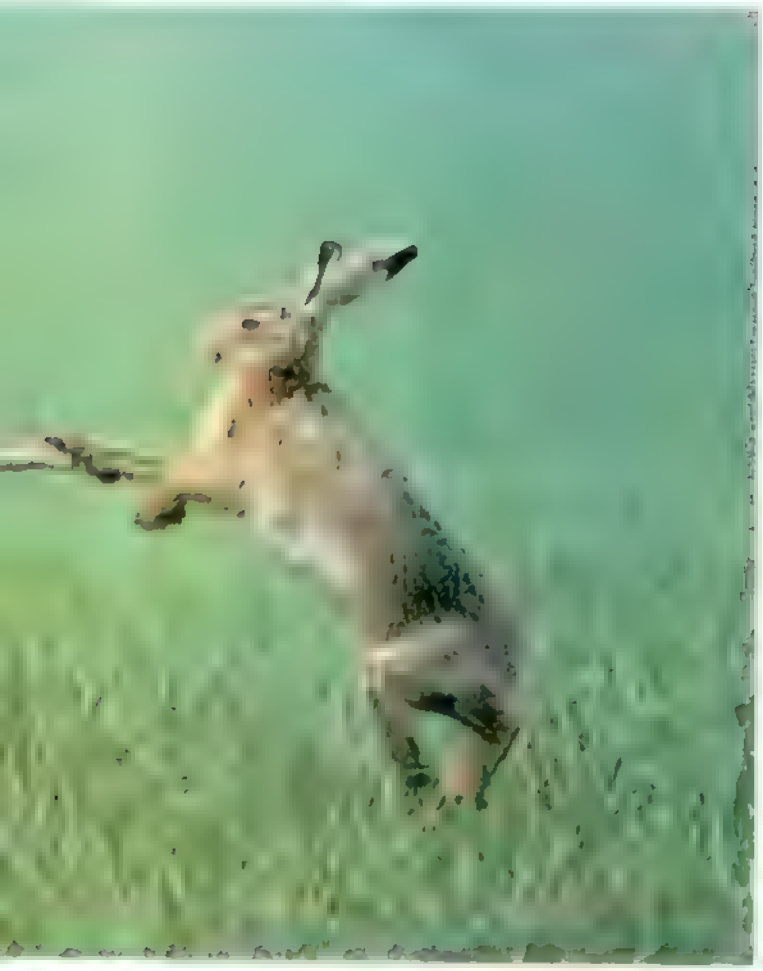
Flying leap

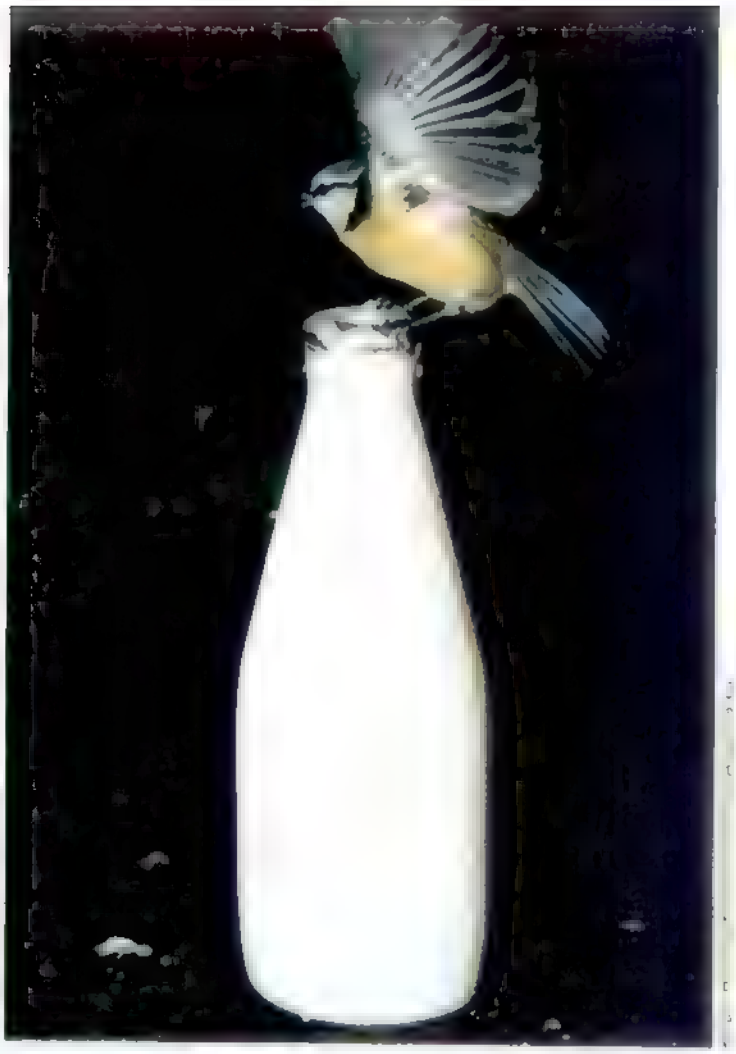
Mole These animals are not seen very often in sunlight but with a little patience you may surprise one. **Koala** A long lens is essential when photographing shy animals like the koala. The photographer climbed a nearby tree for a better viewpoint. **Flamingos** A slow shutter speed [illegible] movement [illegible]

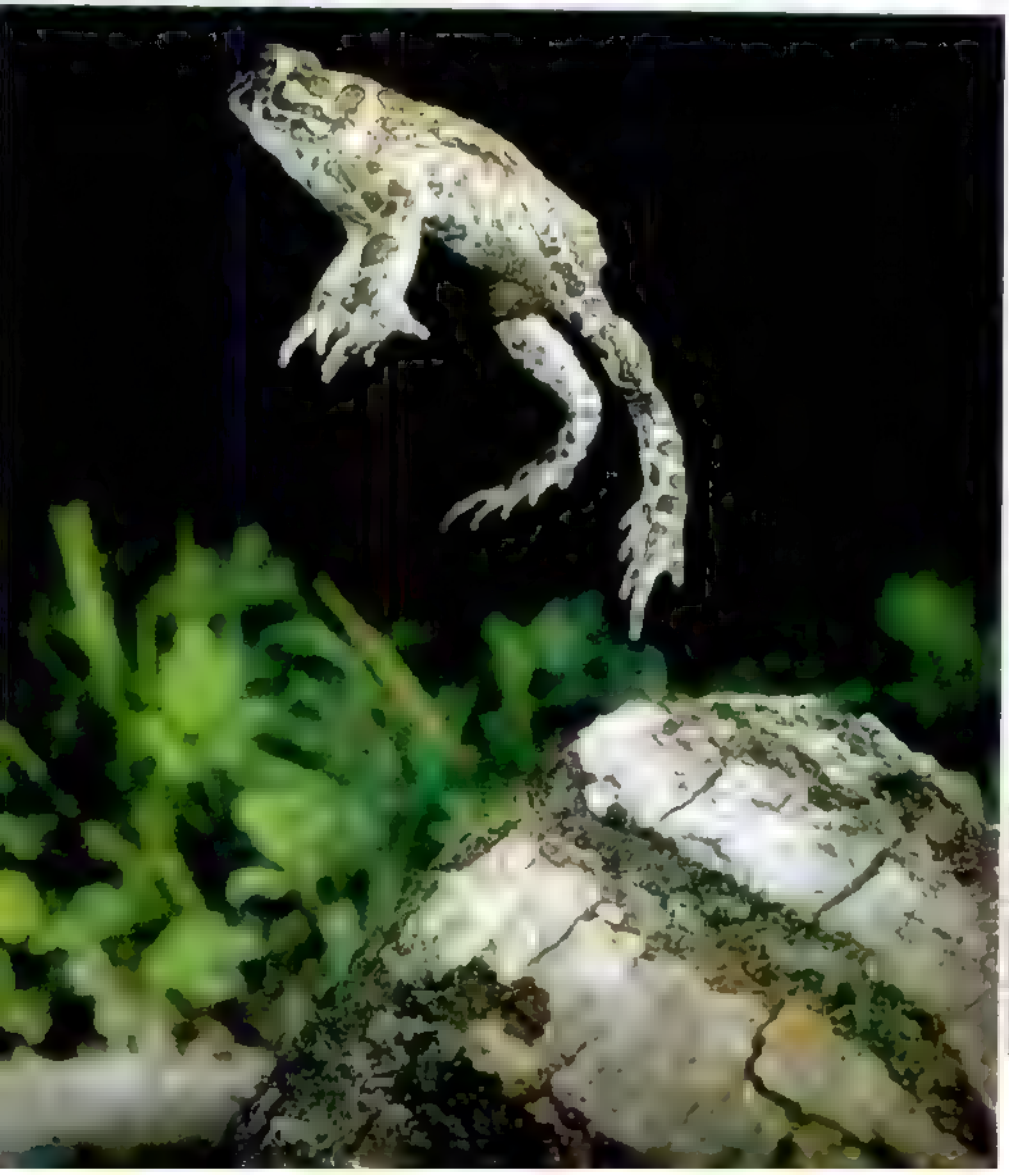


On the alert *Try to capture animals when they make a characteristic action like these standing suricates.* **Necking** *Take the chance to photograph animals and birds during a mating display while they are preoccupied*

Pat Morris, Ardea Photographics







Hare fighting [illegible] **Blue tit** [illegible] **Frog** [illegible]

spotted the creature coming into view it is worth taking a few record shots and then waiting for a while until something interesting starts to happen. You may be lucky enough to catch an otter with a fish or a bird of prey swooping on a mouse. These dramatic moments, though, are rare and many professional wildlife photographers may have to wait months or even years for the opportunity. More usually, the type of action that you can wait for is far more subdued—things like a rabbit scratching behind its ear with its hind leg or a large yawn.

If there is no action whatsoever, or you want to make a straight portrait of an animal, look for lighting conditions and a [illegible] its beauty. Small furry tree-climbing mammals, for instance, often look most appealing glimpsed around the trunk of a tall tree, providing they are looking directly at the camera—without their eyes the shot loses much of its effect. Eyes are important in most posed portraits and they should generally be the focus of attention.

With other animals it may be the texture of the fur that is the most attractive point. This may be best revealed by [illegible] the side-[illegible]. The quality of the light should [illegible] that suits the subject.

For all the [illegible], however, photographs of animals are often marred by a poor [illegible] full [illegible] distracting [illegible]. This may be beyond the photographer's [illegible] Many creatures, of course, have natural camouflage and [illegible] from their surroundings. The only solution may be to selectively focus on the animal using a wide aperture to minimize depth of field. This is probably the best approach with any distracting background. Unfortunately, it may be difficult to keep a moving animal in focus.

Sometimes, however, the background may be too uninteresting—this is frequently the case with shots of herds of deer in the park or horses on the plain. It is worth looking for a tree to frame the foreground.

Of course, the wildlife need not necessarily be the centre of attention. Many attractive wildlife photographs only use animals to liven up the image—shots of birds flying across a sunset, for instance, are very evocative. But whatever approach you take, there is something very satisfying in making a record of glimpses into the lives of animals.

Hans Reinhard/Zefa

R Maier/Vision International

Otter *It is best to photograph from a hide if you want to catch the moment when the otter catches a fish.* **Fox** *A long telephoto and lots of patience are essential for shots like this emerging fox.* **Blue goose** *The photographer has taken care to adopt a viewpoint which does not allow the horizon to cut across the bird in flight.* **Fallow deer** *The dappled light of the forest is an excellent setting for the camouflaged fallow deer.*

First steps with lith

If you are familiar with making prints on ordinary bromide paper, printing on lith should present no problems. Not only is it relatively simple but its effects can give your pictures a completely new look

Barry Lewis/Network

Nude *Shots with a wide range of tones make suitable subjects for lith prints. This nude shows characteristic rough edges between areas of dark and light*

Some of the most creative darkroom effects in both black and white and colour are achieved by using lith film. The material is basically a high contrast emulsion which when developed in special lith developer gives results of the highest possible contrast: pure black and white with no intermediate tones.

By controlling the exposure it is possible to vary the time at which black changes to white. This makes it possible to produce a wide variety of different copies from a single original, each showing different effects. And by printing the results in different tones or colours, any original can be transformed.

Lith film is also invaluable for producing special effects and for copying line originals—that is, subjects with no tones in the original, such as print or line drawings. The high contrast makes sure that the edges of the lettering stay sharp and avoids the risk of grey backgrounds on the copies. The material is therefore useful for anyone who is regularly called upon to make prints of text, such as producing the labellings or headings for exhibitions. The material often called line film—high contrast sheet film—should not be confused with true lith film, which has a thinner emulsion.

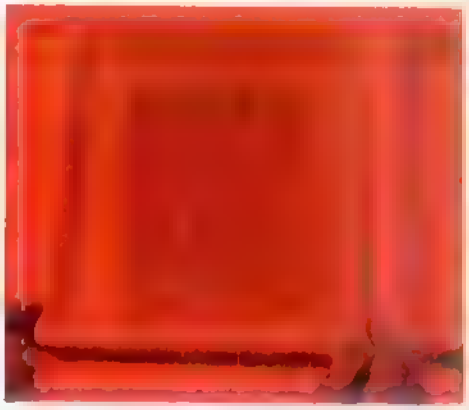
The word lith comes from the film's original use as a negative material for making the lithographic plates used in printing. (It stems from the Greek word lithos meaning stone—from the stone plates originally used for printing.)

While lith film itself is a high contrast material and will give a contrast of about 3 in ordinary developer (compared with a contrast of about 1.5 of conventional camera films), it is intended for use with lith developer. This produces the phenomenon of infectious development. To start with a faint image appears. The most heavily exposed parts of this image then act as development centres—a dense black speck appears and rapidly grows in size. Thus the heavily exposed areas appear dense black, while the less heavily exposed areas are virtually clear. As development proceeds the densest areas grow in size rather than getting blacker, and new development centres appear.

Lith film is available in two forms: orthochromatic and panchromatic.

Making a test print

1 [illegible]



2 [illegible]

3 [illegible]

4 [illegible]

Processing lith film

Infectious development

[illegible]

Contact printing

1 *To make the contact print from the interpositive, sandwich the two lith sheets, emulsion to emulsion, under a glass sheet and expose as planned*

2 *Process the internegative as shown and examine it under a good light. This internegative was given standard exposure and normal development*

3 *Sandwich your negative, emulsion side down, with a sheet of bromide paper under a glass sheet. Make sure that you keep your exposure consistent*

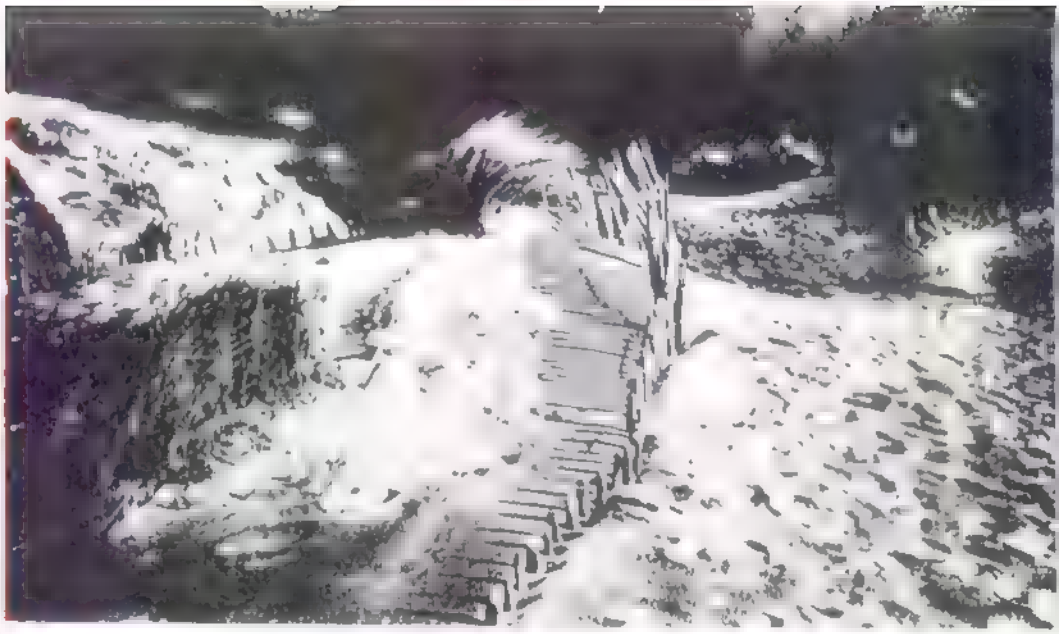
Landscape *You can use filtration to contact print lith negatives on colour paper for very attractive results*

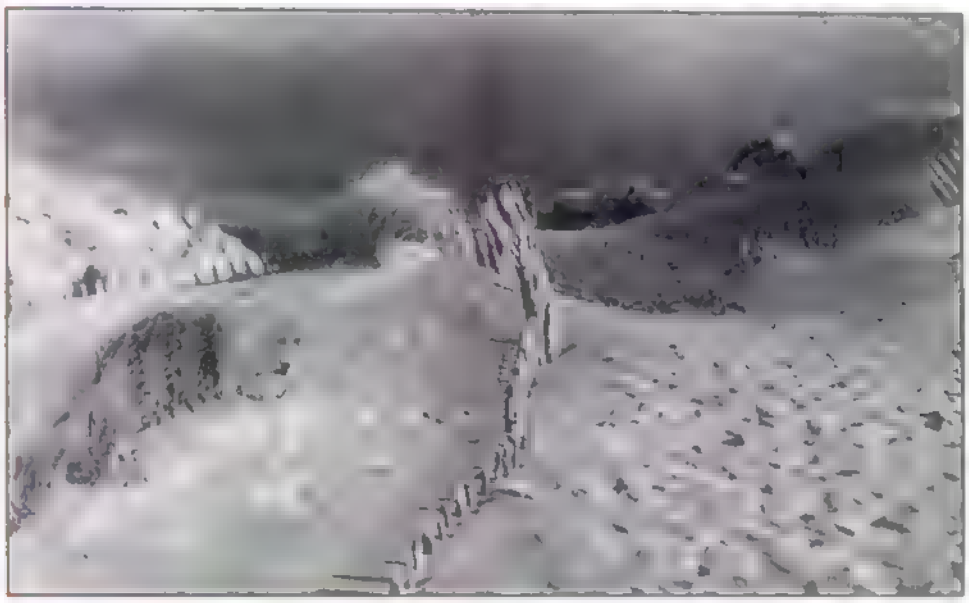
Printing procedure

emulsions can cause [illegible] scattered, giving loss of detail.

When conta[illegible] thoroughly cleaned [illegible] as this can cause 'pinholes' in the image [illegible] caused by imperfect contact between [illegible] as when making the interpositive, you should [illegible] use the same [illegible] the internegative, though this is not critical.

You are now ready to print the interpositive on to a sheet of film, using your [illegible]





Retouching

Contact printing frame

Sand dunes

Using motordrives

Many photographers use motor drives only for capturing the action of fast moving sports subjects, but they can be just as useful for finding the best image when the action is much slower

[illegible]

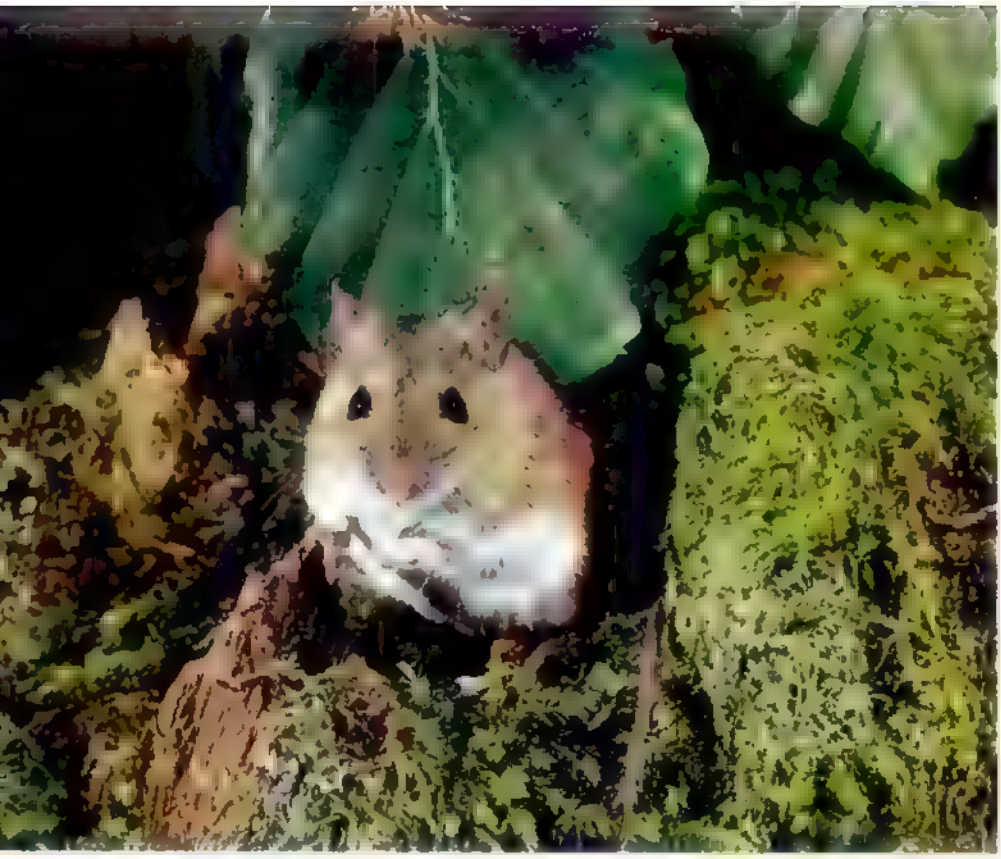
[illegible]

[illegible]

Jan Claude Grelier/Sepia

Billowing skirts *When subject presentation is changing quickly, you can use a motor drive to cover all the action and then pick the best images later*

A cup of tea *Expressions change very quickly and it is easy to miss the fleeting glance which makes the shot. With an autowinder, the camera is always at the ready*



Mouse on a log [illegible]

Learning to ride *A series of pictures often says more than a single image. The strap-on of getting into the saddle wouldn't seem so amusing in just one photograph of the event.*

High speed

For continuous running, the framing rate of a motor driven camera is partly dependent on the shutter speed [illegible] powered device, a motor drive will run faster if you are using a fresh set of cells. The power output of different types of cells is rarely equal, [illegible] and if your drive accepts nickel [illegible] [illegible] shutter is open just [illegible] the precise moment [illegible] wanted to capture. [illegible] better [illegible]

Economy tip

A motor drive or winder can help you in other ways, besides just making it easier or faster to take pictures. If you routinely have duplicates made of your slides, for example, you will find it cheaper to take several photographs of the original scene, rather than copying a master transparency. For projection purposes, this is ideal, because if one slide gets lost, you still have an identical copy.

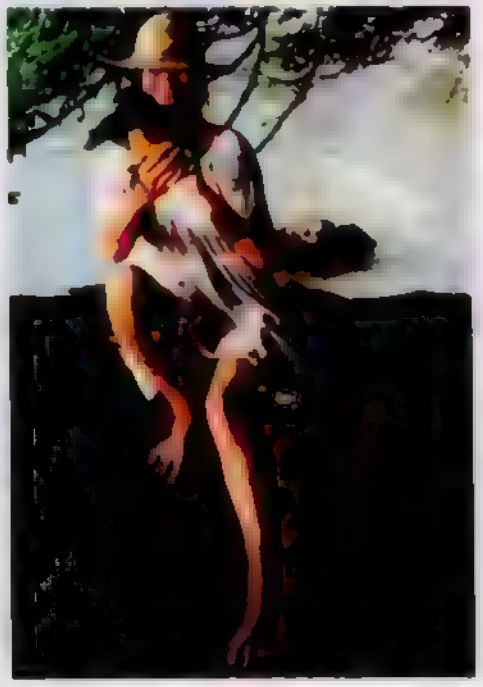
This technique can also save money on colour negative film, under certain circumstances. When you are photographing a group of people, each of whom wants a copy of the picture, the cost of reprinting from one negative can be high. Instead of making one negative, expose as many consecutive frames as there are people, and have the film developed and enprinted. Enprints ordered at the time of processing cost only half as much as reprints, and even taking the cost of film into account, you still save money.

One frame at a time

[illegible]

contact is missed because the camera is hastily lowered to wind on the film. When you are using a motor drive for candid pictures, do not just shoot one frame but wait, and take a reaction shot when your presence is noticed. You do not need the high framing rate of a motor drive – an autowinder will [illegible] the speed [illegible]

[illegible]



A bird in the hand

Assignment

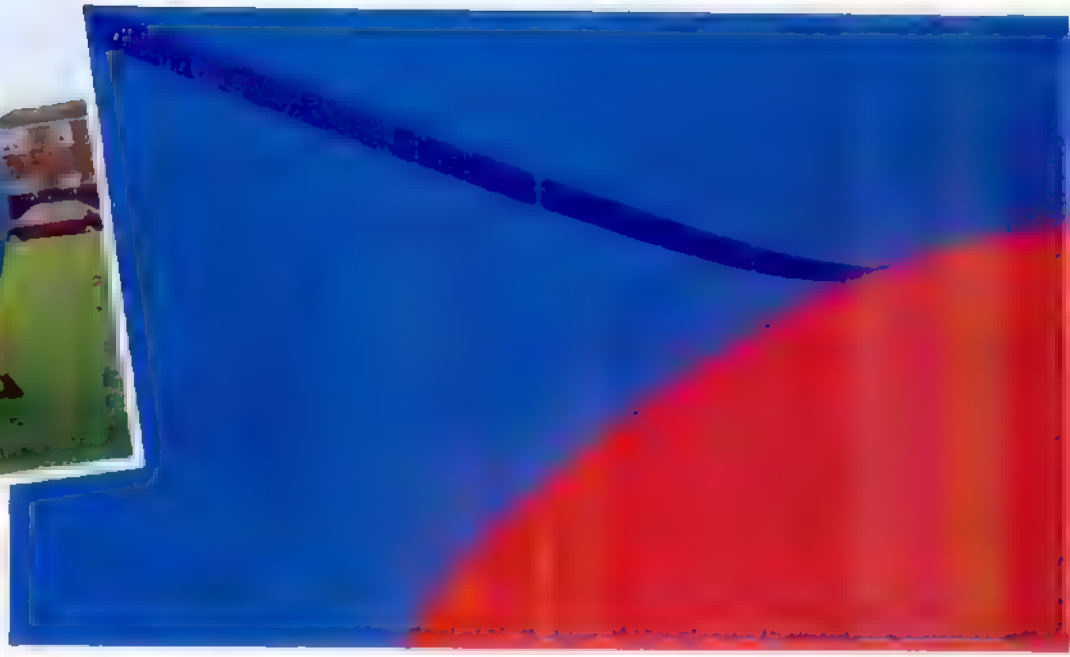
Colourmaze

Photographers interested in abstract forms and colour can find plenty of subjects in the modern environment. For this assignment, Ian McKinnell chose a novel location

Hands *Ian constantly looked for additional features to add relief to the bright colours*

Young people *These shots show how the presence of the children helped Ian to include some variety*

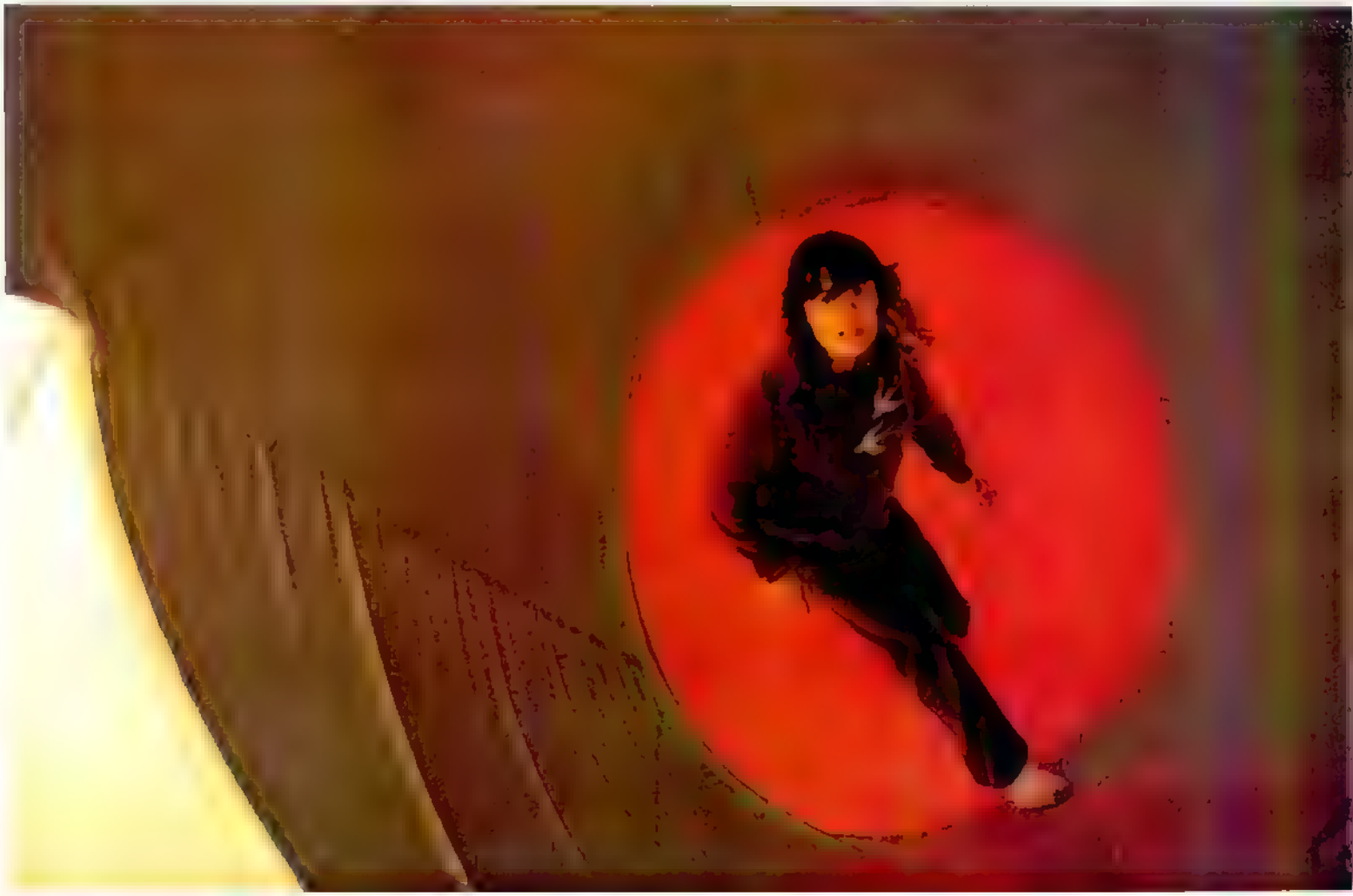
A former graphic designer, Ian McKinnell [illegible] interested in colour and [illegible] subjects. Even though [illegible] subjects to photograph, [illegible] at [illegible] by tutors. [illegible] allowed [illegible]

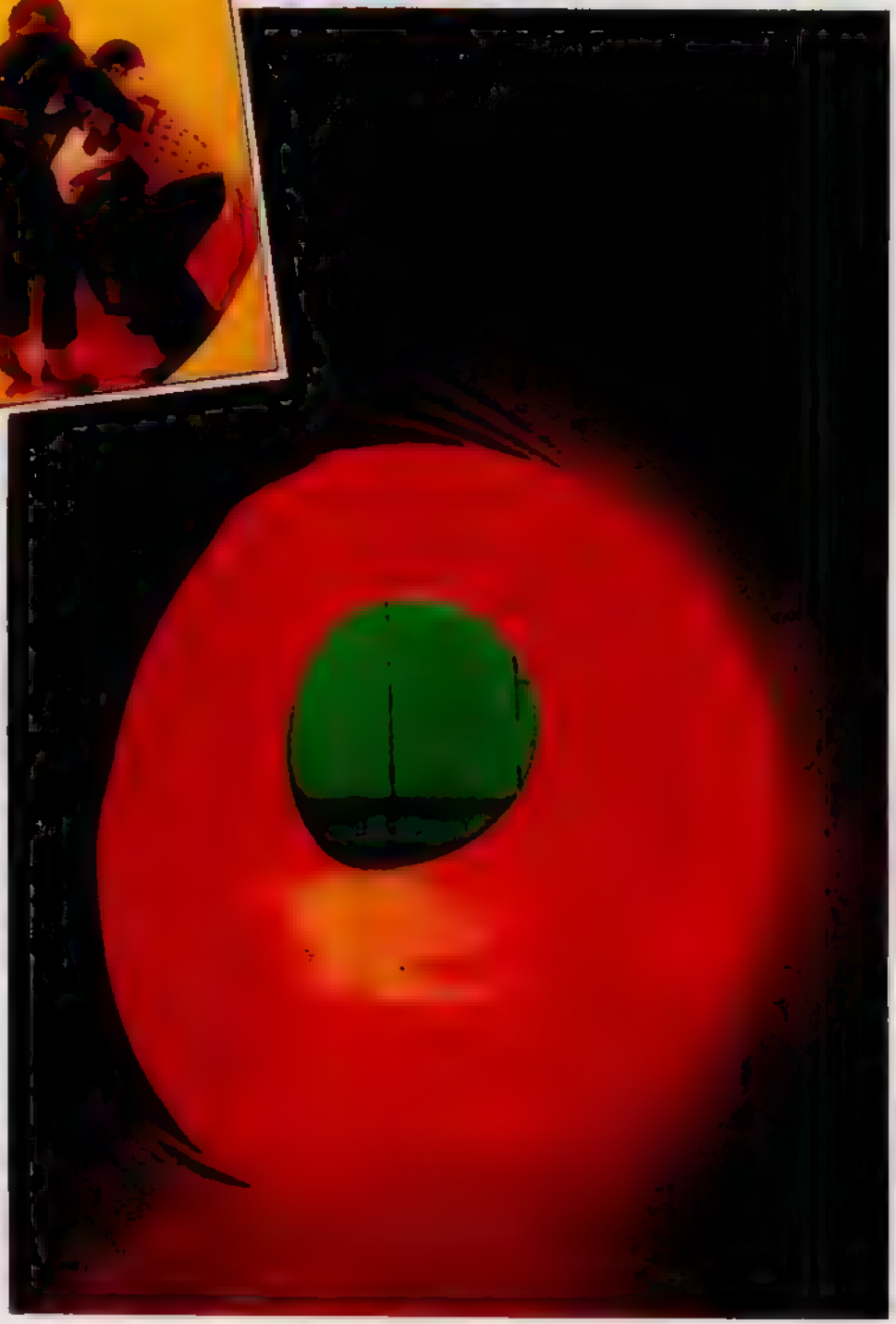


Colour roller

Abstract

Young girl





Study in colour *(above left) For the bright, varied colours Ian used the meter in the camera to gauge his exposure settings but was always sure to bracket so that he had slightly over- and under-exposed versions of the same shot.* **At play** *The excited youngsters hardly noticed Ian at his work* **Deflated** *Even after the fun was over, Ian lingered to grab some additional shots.* **Cave of colour** *The darker areas of colour needed to be overexposed by one stop*

Photographs by Ian McKinnell; stills by Richard Baker, H.

Simple posterization

The high contrast reproduction obtained with lith film allows you to eliminate certain areas of tone in a picture. By combining different lith negatives you can create striking poster-like effects

Much of the appeal of the lith process lies in its ability to produce images that consist of just two tones—ideally deep black and pure white. Many images can be transformed by eliminating all the grey tones completely (see pages 914 to 917) and simple lith work can therefore be called tone elimination, but a whole range of additional effects are possible using the techniques of *tone separation* and *posterization*.

By printing with lith you are in effect dividing a continuous gradation of tones into just two—black and white. All areas lighter than a certain tone are reproduced as white, and all areas darker than that tone are reproduced as black. You fix the point at which the division comes by controlling the exposure.

By exposing lith film for a longer or shorter time you can determine the cut off point at which a mid tone becomes black. For example, if you are working with an image of a face, a short exposure will record only the darkest parts of the eyes, the nostrils and the mouth, which will all print as black. A medium exposure will produce a result with more detail—grey tones may well reproduce as a fine stipple lending some modelling effect. A long exposure will pick up all the shadows and when printed may yield a sombre, mysterious image. Only the brightest parts of the original will print as white.

In such a case, where you are making lith positives from a continuous tone negative, the underexposed film is called the shadow positive, since only the shadows and black areas are reproduced. The overexposed film is the highlight positive, as only the brightest areas will print. Standard exposure gives a mid range positive. Each positive can be contact printed on lith film to give shadow, highlight and mid range negatives.

You may, if you wish, make prints from nearly all negatives or positives—though probably not all of them will yield very interesting results. You can also experiment with exposures between those you have chosen, to bring out some particular feature. Lith film is capable of quite fine discrimination between tones, so it may be possible for example to include either mid tone detail or exclude it altogether simply by varying the exposure.

Geoff Winkley

A posterized print, *made from a normal black and white original, owes its unique quality to separate areas of flat tone rather like those in a poster*

Experimenting with lith

When making lith positives and negatives, the most important stage is choosing the point at which the tones are separated is the test strip, as this gives you vital information as to how the negative reproduces with different exposures. The standard exposure for lith is that which reproduces full blacks and clear whites. If you already have an idea of what that exposure is, you might try exposing the lith sheet for a range of times above and below this. If you do not know what standard exposure is then it is best to expose a test sheet over a wide range of times to obtain as comprehensive a sample as you can of the possible tone combinations.

When you have exposed the test sheet develop it as normal and let it dry. You should view it by daylight or a good room light, as the blacks appear misleadingly dark under a safe light. When you have selected your exposure, make your positives as normal but make sure that you always use fresh developer and develop for the correct time, or you will get a different degree of tone separation from that in your test sheet.

Your first prints will show black and white tones but you can also reduce the exposure on the bromide paper to obtain a grey and white print. This is still a two-tone print but you can control the intensity of the grays so that the tone separation is maintained but the effective contrast is reduced.

As well as using negatives as your originals for lith work, you can also use transparencies. To produce a black and white positive print only one intermediate film is needed, as you are already working from a positive. The first lith print is a negative and can be used to print directly on paper. By making a further lith contact print you produce a positive which gives a negative effect on paper, should you wish to do this.

Bear in mind, however, that as there is only one intermediate stage, the final print will be laterally reversed if you always print emulsion to emulsion. The simple remedy is to place the transparency back to front in the enlarger when making the intermediate.

Making tone separations

30 secs at f/16

12 secs at f/16

5 secs at f/16

The three separation positives above are, from left to right, the highlight, the midtone and the shadow positive

4 secs

4 secs

4 secs

The separation negatives correspond to the positives above but reproduce the same tone ranges inversely

1 *The separation positives are printed using exposures selected from the test print. Notice how each sheet reproduces a different tone range, the highlight print showing only the highlights, and the shadow positive only the shadows*

2 *Each separation negative is printed directly from its corresponding positive. Exposure is the same for each separation, as the different tone ranges have already been separated at the positive printing stage*

Geoff Winkley

3 *The final posterized print is made from all the negatives printed in register on bromide paper. Make a test print to find which exposure gives medium grey on the paper, and use that exposure for each separation. Notice the flat areas of grey, black and white, and the absence of any tone gradation. Although you can theoretically print any number of separations, the more you make the closer you get to a continuous tone print, so it is better to make only a few separations for the best effect*

[illegible]

Multiple tone printing

[illegible]

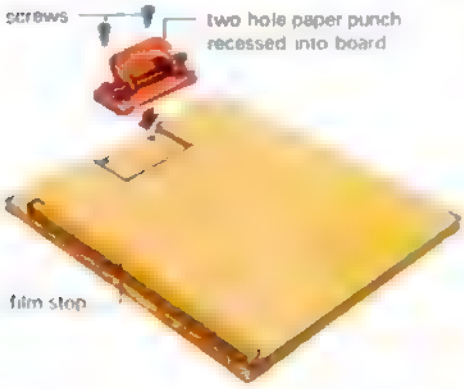
Multiple tone separations are made by printing several different lith negatives on the same sheet of paper, one after another. Each negative has different areas of black tones, and acts as a mask for a given part of the print At the end of the printing process, different parts of the paper will have been exposed for different times and will show different tones of grey or black

For example, if you expose three sheets of lith, underexposing one, correctly exposing the next and overexposing the third, each will show a tonally different positive when developed. One will record only the deepest shadow areas as black, another will record mid tones and shadows as black, and the third will have all tones black except for the highlights. You can then contact these on lith to make negatives for printing

The three negatives are then printed on a single sheet of paper to produce a tone separated image. To do this they must all fit over the paper in register—that is, they must all be exactly aligned—otherwise the image will not be clear and the edges of tone areas will not fit over each other properly

A punch system is the best method of registration. This makes two or more holes near the edge of each sheet of film or paper. These holes correspond exactly to pins on the enlarger baseboard, on to which the film will fit You can punch the material before exposure, and then locate it on the pins in the dark, knowing that the projected image will fall exactly in the same place each time

After you have processed your lith negatives, you can print them in sequence on the same sheet of paper, as the pins ensure exact registration. A



good economy technique is to tape a strip of old film along one edge of each lith sheet, and punch holes in this, so as to make the most of your valuable material

The simplest registration technique is to use an ordinary office punch and a two-pin board which you can make yourself quite easily. Alternatively, you can buy a special photographic punch and a pin bar which can be taped to the enlarger baseboard. Although this is a much more accurate system, it is also much more expensive to buy. However, if you plan to do a great deal of tone separation work, it might be worth the expense

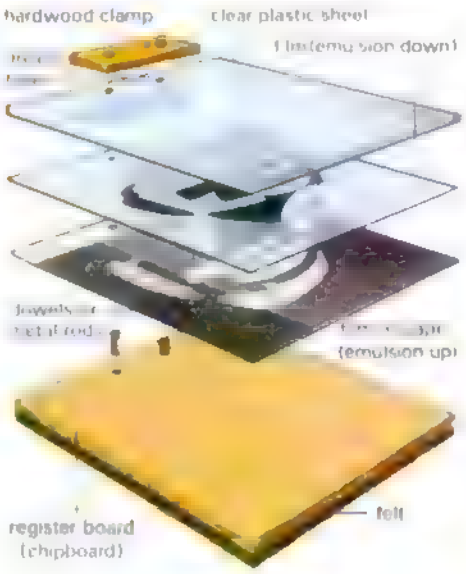
For the cheaper system, buy a good quality office punch, strong enough to punch holes in a sheet of plastic film without tearing it or buckling it. As you will have to use it in the dark, set it into a board as shown, so that the film remains level during punching. You can make your pins from wooden dowelling, or by cutting the heads from thick nails and filing them down smooth The pins should be fitted into a piece of board larger than the largest piece of material you are likely to use. A photographic punch cuts two differently shaped holes, so you cannot load the film the wrong way round in the dark. Sets of precision-mounted pins are available, which can be taped to the baseboard.

Before beginning to make your multiple tone separation, you should punch all the material you need in the dark and put it back into light-tight boxes or envelopes. Orthochromatic film and paper can be punched under a red safelight

When you have selected your negative for printing, place it in the enlarger and project it onto the baseboard. You should leave a wide margin for the registration holes. Having lined up the image, place a register pin bar close to the image and tape it into place

You are now ready to make a test sheet, which will allow you to select the tones you want to print. You need not register the film for the test sheet, and you should expose it as you would for a single tone separation Process the sheet and decide which tones produce the tone differences you want As a general rule, it is advisable to choose the exposure times which produce the most distinct differences You could choose to make any number of negatives, but for

Registration *To keep the film exactly level when punching, set the punch into the board as shown left. The method of registration and contact printing shown below gives good results if used with care. If your sheet of film is the wrong size for the pins you can still register it as shown right*



the first separation it is probably best to use only three

Take a punched sheet of lith film and position it over the pins on the enlarger baseboard Expose it for one of your chosen times Repeat with the other two sheets, giving your other two exposures

Process all three sheets, then contact print them on three more punched sheets You should give each of these a normal exposure, to reproduce your positives as faithfully as possible.

You can now contact print each negative in turn on to a single sheet of normal grade bromide paper. You should give each negative just enough exposure to produce a mid grey tone on the paper First, make a test print to find out what this exposure is With the darkroom light on, tape a piece of bromide paper, emulsion side up, next to the pin register bar. Place the first negative emulsion side down, on the paper, and make a test strip Process the paper and examine it in the light

Tape down another sheet of paper, and place the first negative over the pins Expose, then replace this with the second stage negative, then repeat the process for the third. Always keep to the same exposure, and remember to contact print emulsion to emulsion

If you have registered each sheet correctly and exposed properly every time, your finished print should now show black, white and two intermediate tones of grey Using two negatives, you produce only one grey tone, using four, three grey tones and so forth

As well as printing from three negatives, you can try different combinations of negatives and positives. You might, for example, try printing the shadow positive first, and then print the mid tone negative. Sometimes, when printing both positives and negatives together, you produce thin line effects which are very pleasing These are caused by the dark areas of a negative being slightly different in size from the corresponding areas of the positive This allows a little light to pass, forming a very thin line on the paper.

This process of tone separation is in fact a form of posterization The simplest poster printing method can only reproduce uniform tones, so all images must be reduced to basic tones, which may then be superimposed A tone separation, or posterization, has the same appearance, as graduated tones and colours have been replaced by flat

Paul Williams

areas with distinct borders Colour posterization, dealt with in a subsequent article, offers even more possibilities than black and white, and once you have mastered monochrome you can easily progress to colour work

Assignment

Coney Island

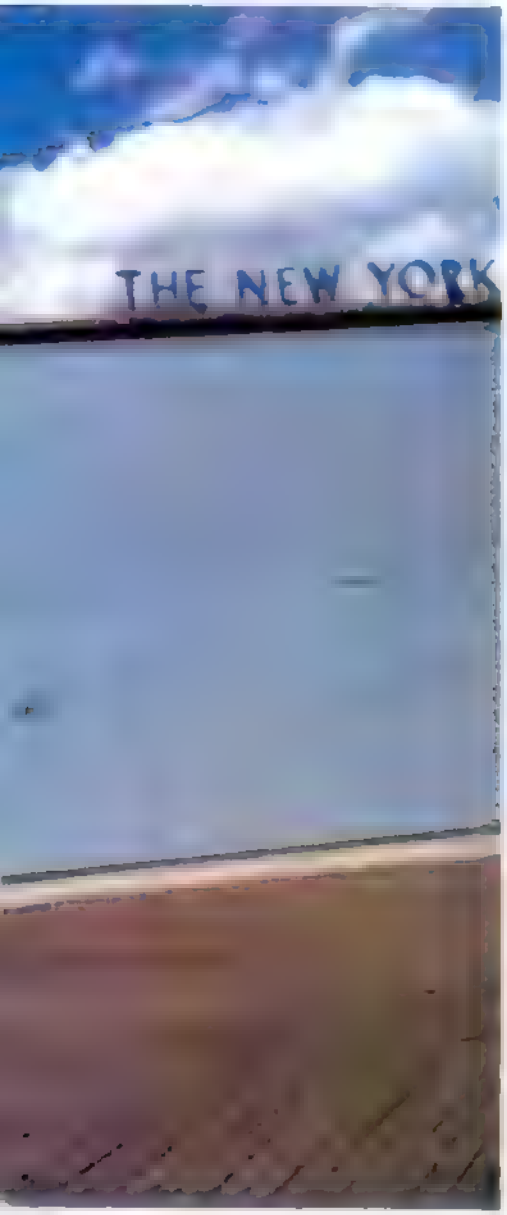
Picture postcard shots of a resort usually show only one side of its character. With imagination you can find many more revealing aspects

Homer Sykes

Catching people off guard with a camera is not the sort of thing that appeals to everyone—especially if it is to be done in a foreign country but for Homer Sykes this sort of photography has helped build up his professional reputation. When he paid a visit to Coney Island near New York, he spent most of his time photographing the people in relation to the environment rather than concentrating primarily on the place itself.

In its heyday Coney Island was known for its spectacular amusement park but now while the entertainment still survives, the area has become run down and its splendour has tarnished. Homer wanted to capture this atmosphere of decay while also revealing stories of Coney Island's

Old lady *Homer noticed the background of this shot first—the soft blues and the small cloud, the lettering and the glimpse of Astroland—and then he waited for an interesting character to walk into the foreground* **Robert, John and Martin** *Initially Homer noticed some people next to these posters but then he moved closer for this eerie detail*



Aerial view *An overall shot of the area is useful for setting the scene. This was taken through a window and Homer bracketed to guarantee optimum results*

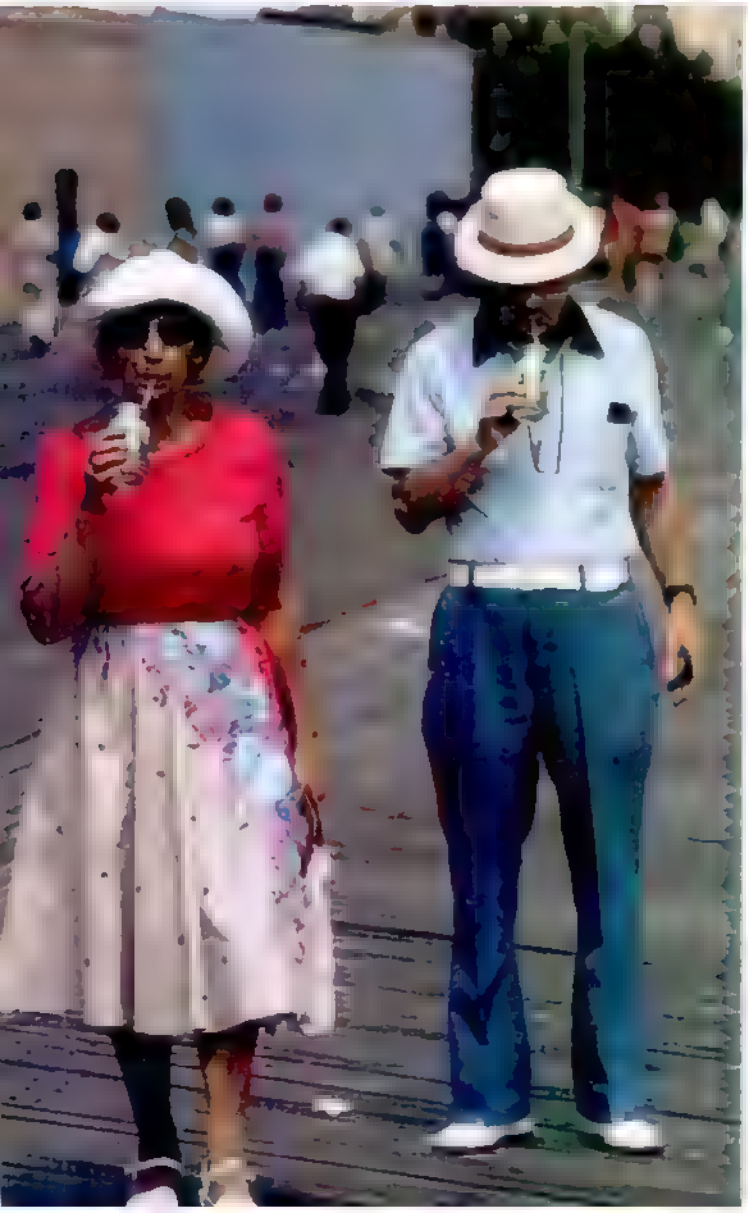
Relaxing in the sun *This shot was taken because the appearance of the people was so striking. Homer used a 28 mm lens and pretended to aim past them*

Movement *Dynamic pictures of fun fair rides can be taken with slow shutter speeds—here Homer used 1/8 second*

Phone booths *Graffiti is everywhere in Coney Island so these phones added character to this candid shot*

Inflatable pet *This shot was taken with the 180 mm lens so Homer could keep his distance, but the overhead midday sun cast a shadow across the man's face* **Car Park** *A polarizer was used to deepen the colours of this urban landscape* **Horse** *The animal looked rather out of place and made a fascinating subject. A 28 mm lens allowed other details of the scene to be included*

Peering out *The strong diagonal lines, warm light and bold colours dramatically enhance this frame within a frame portrait* **Boardwalk couple** *Coney Island is full of interesting characters. A 180 mm lens caught the main details — a pair of hats and cold drinks* **Monster** *Homer wanted to feature the monster in a shot so he waited until something interesting happened in the foreground before making the exposure*



Lens design

As lenses become more versatile, designs become more complex. Although modern design techniques are very sophisticated, the basic principles remain unchanged

High quality photographic lenses such as those for most SLRs can produce images of startling clarity and sharpness. But designing a lens of this standard, where aberrations are at a minimum and resolution is at a maximum, involves many complex calculations and development procedures

The theory that goes into lens design is generally straightforward The most important fact that the designer must know is the *refractive index* of the glasses that are to be used for the lens. The refractive index of a glass is a measure of its light bending power—usually measured to several decimal places for each type of glass

Once the refractive index is known, the lens designer can calculate what happens to any light that falls on the lens and so determine whether the design is a good design before it is actually made But the calculations are long and complicated, particularly with multi-element lensus such as zooms, and, not surprisingly, computers are now becoming an increasingly important part of the design process. Computers can perform tedious and complex calculations in a fraction of the time taken by previous methods

A basic starting point is still needed, and this is provided by a design team headed by an optical designer Their experience and knowledge help to avoid designs which, in the end, are unlikely to produce satisfactory lenses

David Hoffman

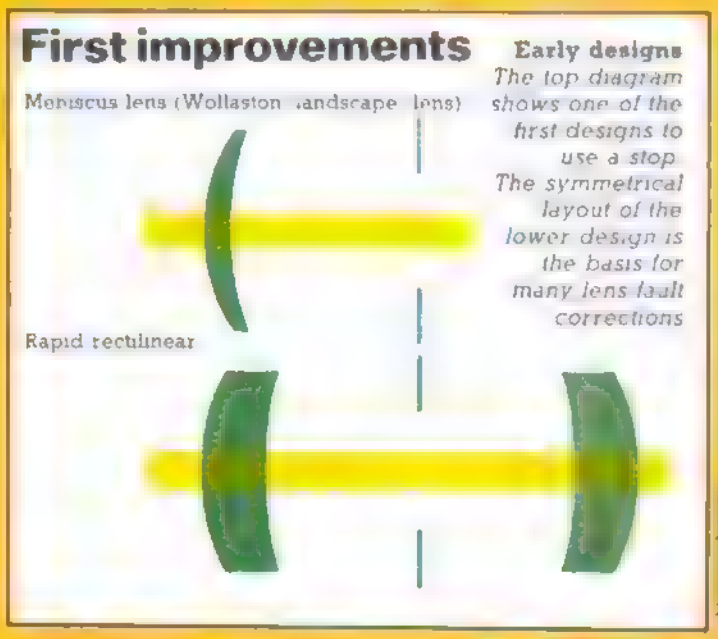
Simple lens *The image formed by a simple lens contains many faults. These are corrected by using more elements*

Predesign

The first step in any design process is to identify what the lens needs to do It may be required to fill a gap in the manufacturer's range, or to replace an old design with a lens that is more compact or has a larger maximum aperture. A *specification* is produced, listing the required focal length, aperture range field of view, resolving power, closest focusing distance, overall size and other features

Most importantly, however the designers must ensure that the final cost of the lens is geared to the market it is aimed at—a high quality lens is useless if no one can afford to buy it. In addition, there may be special considerations, such as the use of special glass — types of optical glass can vary in cost by a factor of 300 or more

Designers achieve the required specification by varying the number of glass elements, their shapes—the way the surfaces curve, their diameter and thickness — their spacings and the type of glass, plus the position of the iris diaphragm. All these features interact and must be combined to meet the specification with the minimum of aberrations. For example, the number of elements needed is related to the maximum usable aperture and the angle of view required. A 50 mm *f*/2 lens may need six elements where one of *f*/1.4 needs seven. A 24 mm wide angle lens may need ten elements, but a 200 mm long focus lens can perform well with only four



Venner Artists

With general purpose lenses, the final design is often a compromise. With lenses designed for more specialized purposes, one aspect of the design may be given greater importance. For example, a lens intended for copying work is usually corrected for aberrations at the expense of speed and has a relatively small maximum aperture

Once a possible configuration is decided upon, from experience or a past design, a *thin lens* predesign calculation is made. This is a quick 'try-out', using a programmable calculator or minicomputer to calculate the effects of the design. The lenses are treated as having negligible thickness, allowing greatly simplified formulae to be used In this way, the designers can get an idea of the best layout of the elements These calculations include allowances for different types of glass as well

Venner Artists

50 mm standard lens

The basic routine is one of repeated *ray tracing*—calculating the path of each ray of light as it is refracted by the elements. This is achieved by applying a formula given by *Snell's Law* which makes it possible to calculate the refraction of a light ray at every air–glass surface or glass–glass interface, according to

the angle at which it arrives and the refractive index of the glass. Aberrations can also be allowed for in the calculations.

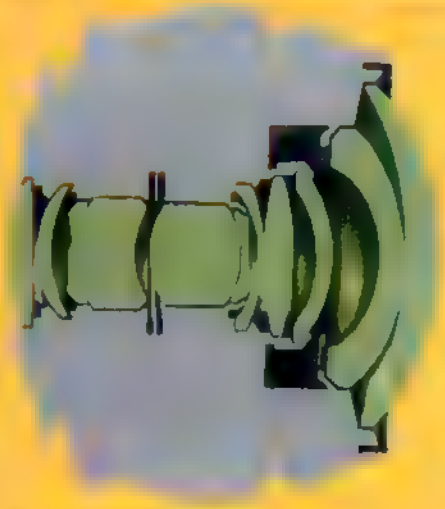
To make the lens one of the variables is altered such as the curvature of one of the lens surfaces or the position of an element and more ray traces are done to see the effects. Some aberrations are very sensitive to small changes in such variables, others are not. The procedure is for a right of a single wavelength. Later the lens can be further corrected by applying a similar process.

Design optimization

The result of the previous efforts, often an excellent result, is then further refined by a design optimization program in a computer. This is another ray tracing process which assesses how the finished lens will behave particularly in regard to the spherical aberrations (see page

Dave King

Three standards
The three 50 mm lenses above all have maximum apertures of f/1.8. But they differ in design and size. There is no single answer to the basic design specification



Design variation
Different focal lengths require very different designs, with variations in the number and type of elements

18 mm wide angle lens

9.6). The computer can then present a first design.

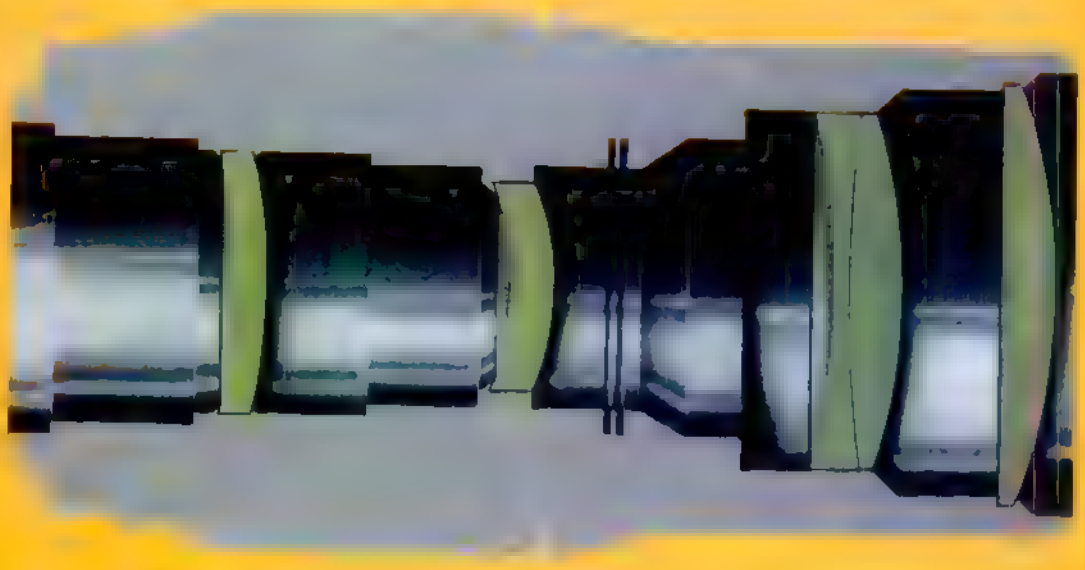
Thousands of calculations are performed to rework the lens to give the required performance. The result is then passed on to the optical engineer, who can make judgements as to its suitability for manufacture. An element may be too thin or too steeply curved for easy manufacture. It may be possible with a curvature which is nearly flat, to actually make it flat by slightly altering other elements so reducing manufacturing costs.

There must be some tolerance in the design to very slight variations in manufacture and assembly, setting limits on thickness, the refractive index of each element in the mount and other variables. A design with a high rejection rate in manufacture is a costly lens. The design is then reworked until an acceptable compromise is reached, and a barrel and focusing mount designed for it as a separate mechanical design job.

Variety of designs

That there is no perfect solution to a lens design is shown by the variety of lenses with the same specifications — there are for example many 50 mm f/1.8 lenses — differing in the arrangement of elements and glasses as well as performance.

Lenses also have more subtle characteristics put in by the designer. A lens may be corrected to give a high contrast image at the expense of resolving power, or the converse. It may give a very sharp central image with poorer corners, or a more even overall performance of lesser sharpness. More ambitious designs can now be tackled, such as wide angle zoom lenses as better configurations are learnt from design progress. A lens may be made in many different configurations.



200 mm telephoto lens

Vennar Artists

Composition and cropping

Good composition relies on careful subject framing, but if you cannot achieve exactly what you want on the spot, you may be able to crop your pictures later

No matter how photogenic a subject is, it will not make a good photograph if it is not properly framed—many otherwise excellent shots lose their impact because the subject occupies too small an area of the frame or is overwhelmed by the surrounding detail. Intelligent cropping, either in the camera or on the final picture, can often improve a picture considerably and can sometimes transform it completely.

There are in fact two distinctly different kinds of cropping—the first is used to exclude unnecessary or distracting detail to improve the composition, and the second is more drastic and can be used to create an entirely new picture or interpretation of the subject itself.

Some great photographers—Henri Cartier-Bresson, for example—will not allow their pictures to be cropped at all. Cartier-Bresson takes exceptional care to frame his subject fully, making sure that all distracting and unnecessary elements are cut out and that the centre of interest is precisely where he wants it to be. In order to do this he crops creatively and decisively, not as an afterthought but in the viewfinder at the moment of taking the picture.

Ideally, this is where all creative cropping should be done. However, most photographs are taken in far from ideal circumstances—news pictures and candid shots in particular. In these cases events may happen so quickly that there is no time to do anything other than press the shutter and record the moment. It is much more important to catch the winning goal of the match or the bride's expression as she is presented with a giant meringue, than it is to achieve the perfectly composed picture. You can always crop out unwanted items later and centre the interest on the incident itself.

In order to crop creatively you should be aware of the elements of design which are involved in the making of a good picture. Cropping can be used to emphasize or enhance certain design elements or to diminish or conceal others. Even before you have pressed the shutter, part of the picture design has already been chosen for you.

For instance, the ratio between the width and the height of the frame is determined by the format of your camera. This may be the usual 3:2 of 35 mm full frame cameras, or it can be 5:4, 6:7, or even 3:1 in the case of panoramic cameras. It is easy to overlook this kind of restriction—some pictures may look better with an alternative format.

In just the same way, the fact that you have a rectangular picture is also a design choice—pictures need not be rectangular. If it is seen in this way, the possibility of cropping to many different shapes becomes apparent. Even square pictures can be cropped, for instance, and many head and shoulders shots can be given an old world elegance by cropping to an oval shape. An action shot, on the other hand, may be given more tension by the use of a panoramic format.

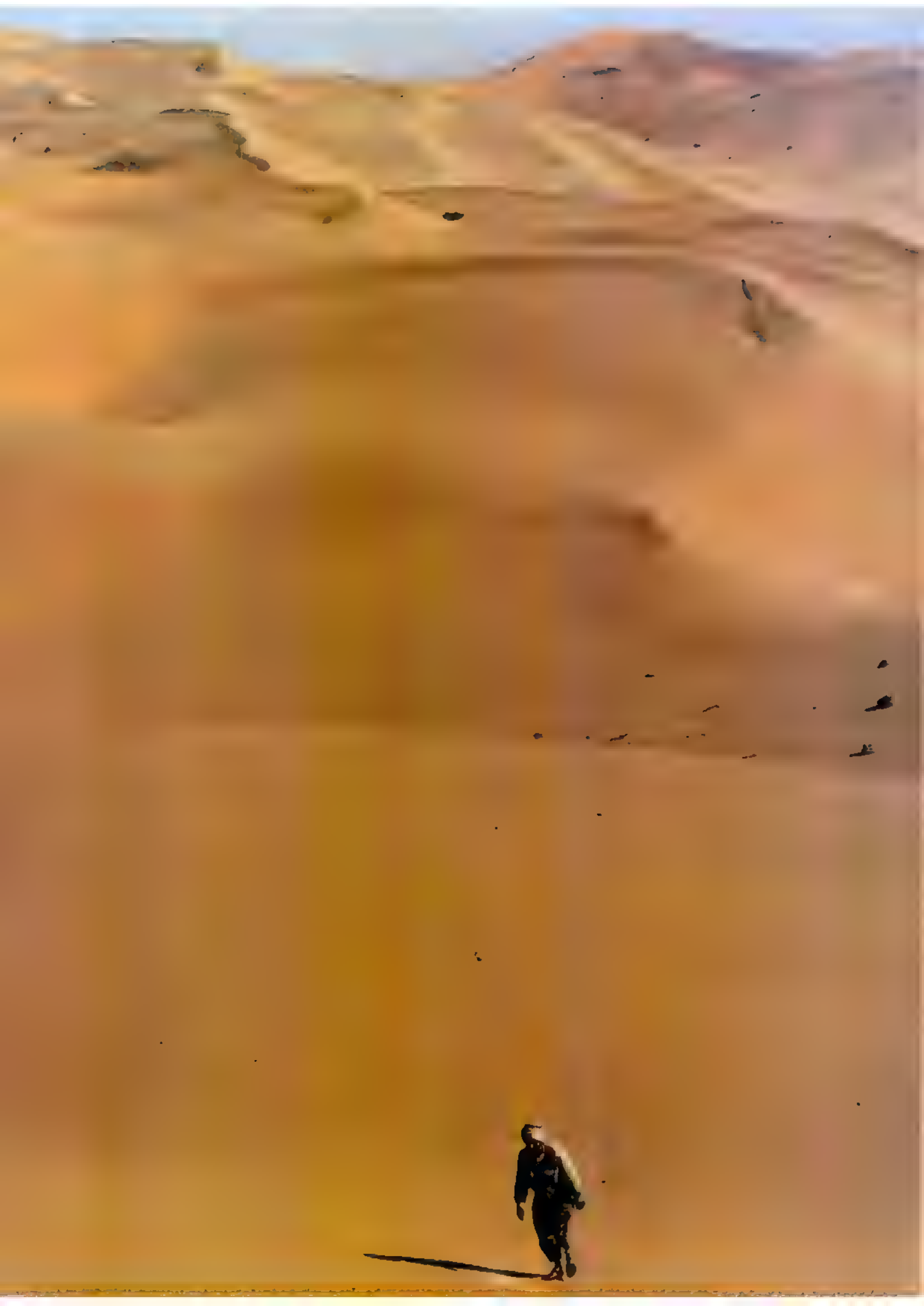
With the standard format, correct cropping can be equally effective. The positioning of subject matter within the frame, and its relationship to the frame edge, can have an enormous effect on the picture and its meaning. The best photographers are continually aware of this. John Hilliard, for instance, has made a series of four pictures called Cause of Death from the same negative. Each picture has been cropped differently to give a totally different meaning to the image, and yet each picture is basically the same shot of a shrouded figure lying on a beach. The titles are Crushed, Drowned, Fell and Burned, and in each case the title represents the meaning given by a different crop.

While the frame can be positioned to exclude or include particular parts of an image so as to create a certain meaning, it can also be used as a compositional device in itself. A popular picture is one which shows a scene viewed through an overhanging branch. This is one way to use a frame within a frame, a device which gives depth to the image. The eye sees the frame as a window through which the gaze travels to find another 'window' (the frame formed by the overhanging tree). Different distances from the viewer are established in the picture, and an impression of

Man and desert *Cropping out the figure would completely destroy the impact of this picture*

Trees *Cropping in different ways creates entirely different images from the same original picture*

Ed Buziak



Ian McKnight

Truck *A dramatic crop to one small area of the truck gives an abstract image from a 'standard' original*

Archway figure *The large dark area on the left of the picture dominates the image. Cropping into the picture in this way emphasizes the shape of the lone figure within the archway*

Turkish gunman *A moving subject needs an empty space to move in to*

Richard & Sally Greech

John de Visser

The process of cropping

The essential tools of cropping are fairly straightforward. You will find it helpful to use two L-shaped pieces of firm card, preferably black. The two pieces together create a boxed-in area in which you can compose the picture you want, excluding something distracting, or an empty area that contributes nothing.

While it is relatively simple to eliminate part of a black and white print, either by cutting off the cropped out area directly, or by cropping it off in the enlarger when you make another print (see page 434), it is more difficult to crop a transparency. You can use masking tape over the cropped out area, or you can buy a masking frame of a more interesting shape. Alternatively, you can have a duplicate transparency made which includes only the needed area. Until recently, this was best left to a specialist colour laboratory. Now attachments can be fitted to the camera to make duplicate transparencies with a zoom principle (see pages 728-730). The original slide is put into the duplicator and the camera focused on it. The zoom lens on the duplicator is adjusted so that the portion of the original which is not required is zoomed out of the viewfinder, and the new duplicate contains only the enlarged area of the picture which is needed.

Fishing *Here, a third figure was cropped out to improve the balance*

Bjorn Borg *The strong diagonal lines give a sense of dynamic action, while tight cropping emphasizes the service*

[illegible] from it. Used well, rhythm [illegible] and freshness in a picture.

Composition, therefore, is simply the [illegible] arranging the contents of the picture—shapes, lines, tones and colours—in a pleasing and effective way. In most cases, a well-composed picture is not

Horse *A subject can often be depicted more dramatically if you crop right down to one strong feature*

Country garden *Some pictures work best when the subject fills the whole frame*

[illegible] that it is [illegible] way [illegible] cropping after the exposure has been made, is an illusion. But you did not get the picture to put in those [illegible] points would repeat the improvement in strength and emphasis that creative cropping can bring to these near misses.

Only a few pictures out of the hundreds of exposures made actually become great pictures. While they can, and be created because someone has been in the right place at the right time, they become great pictures because every element in the picture is important and nothing is included which is not needed. Whether in the view [illegible] or after [illegible] they work more as the difference to one of your pictures.

Colour processing equipment

The basic equipment needed for making colour prints at home need not be expensive, and if you choose to use colour processing drums rather than trays most of the work can be done in the light

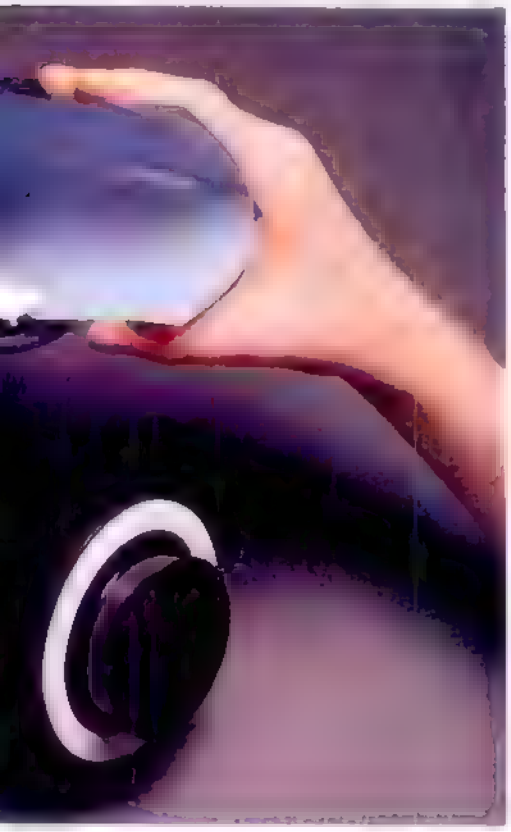
Processing colour prints at home used to be considered too difficult for all but the most dedicated amateurs. Modern equipment together with less temperamental chemical processes has now made colour processing almost as easy as black and white. Indeed in some respects making colour prints can be even easier than black and white, provided you choose the most suitable equipment.

While black and white prints can be processed in ordinary room lighting, more elaborate equipment is generally required for colour printing for a number of reasons. First of all, because there is no fixed exposure for colour paper, processing has to be performed in almost complete darkness, making a print from start to finish a complicated work of darkness. Second, colour processing needs a darkroom at a temperature

Roll your own *There are different sizes of drum. Some are revolved by turning a handle. Other, smaller drums, are rolled by hand*

Loading the drum *Curve the print slightly and push it, emulsion inwards, into the drum. Print dividers allow you to load two prints. You must load the drum in total darkness*

Processing drums



Joff Bowden – equipment courtesy of Paterson

Dismantled drum *It is important to be able to take a processing drum apart easily so it can be thoroughly cleaned and dried between sessions*

Extra equipment

Jon Boucher equipment courtesy of Paterson

Colour processor *This has its own tempering bath which you fill with hot water to keep the solutions warm while turning the drum with a handle*

each print is processed and to ensure accurate temperature control throughout the process you can also use special drum rollers that incorporate a thermostatically controlled water bath. The drum is rotated in the machine while partially immersed in the water bath. There is usually a section of the bath into which chemical storage bottles can be placed to ensure that they too are at the correct processing temperature. These machines are expensive but give excellent results. Separate temperature control units solely for chemicals are also available. These are known as *tempering boxes* (see page 946). Most use water baths, but one unit heats the chemicals with a hot air fan. Tempering boxes are not strictly necessary but some printers find them very useful.

One device you can use to make colour processing much easier is a programmable timer. These are usually simple clockwork minute timers with dials into which small plastic markers can be slipped. As each marker reaches an index mark a bell is rang reminding you to pour out one solution and move to the next processing step. More expensive electronic timers are also available, some of which can be connected to a drum roller so that processing is automatically halted at the correct time.

Motorized drum *This processor can also be fitted with a battery-powered motor which saves you the trouble of turning the drum manually*

Other approaches

While drums are ideal for amateurs who work on a small scale they have a number of drawbacks for processing large numbers of prints or single large prints. If you need to process a large number of prints quickly for instance it is a chore to have to clean and dry a drum thoroughly after each set of prints is processed. The dividers that hold prints apart in drums may also cause very slight unevenness in processing at the edges of prints and this can only be trimmed off after the print has dried. Extracting wet prints from a drum at the end of the processing sequence can cause damage to the delicate wet print emulsion, particularly if you are in a great hurry.

One solution to the problem of limited drum size is simply to use a larger drum. Drums intended for the small scale user usually start at print sizes of 20 × 25 cm and go up to about 40 × 50 cm. Very large drums up to 60 × 80 cm are available but these are moving away from the simple drum principle. They take a large number of smaller size prints are mechanically driven, have thermostatic control of solutions temperatures, and even include automatic chemical emptying.

For semi professional printers the

Jon Bouchier, equipment courtesy of Jobo

Jon Bouchier, equipment courtesy of Paterson

simplest alternative is a *deep tank processor*. In principle these are very similar to dishes, but without some of the disadvantages. Deep tanks of solution are held at a constant temperature by a thermostatic heater. Exposed sheets of paper are loaded on to hangers and placed in the tanks. Oxidation is reduced by the small surface area of the chemicals exposed to air.

These units need to be used in total darkness, but since they are compact and easily manipulated, this is not too great a problem. They are particularly suitable for use with Cibachrome, since normal room lighting can be turned on halfway through the second processing step (the bleach) without noticeably affecting the results. Chemical concentrations are maintained by replenishment, adding a small quantity of fresh solution to each tank after each processing run. Floating tank lids prevent chemicals oxidizing when the unit is not in use.

Roller processors are a more sophisticated method of print processing, usually only found in professional darkrooms, though there are a few small roller processors suitable for home use. They consist of a motorized unit incorporating temperature control and usually some means of automatic chemical replenishment that transports exposed printing paper through a series of rollers and into chemical baths. Exposed prints are simply fed into a slot at one end of the machine and removed fully processed from the other end a few minutes later. A continuous stream of prints can be produced with little effort once the machine has been set up. Their main disadvantage is their complexity, and they have to be carefully taken apart and cleaned after each printing session. Roller processors that handle prints from negatives cannot usually be adapted to making prints from slides and vice versa. The main drawback for the amateur, however, is that even the smallest roller processor is very expensive.

Other approaches to colour print processing have been tried in the past, such as laminar flow processors, which run a thin film of processing solution over the surface of the print, and the Colour Canoe, which was an intermediate stage between dishes and drums.

An alternative method that may one day give the equivalent of the drum in the small darkroom has recently become available. This is the Kodak Ektaflex Print Making System, which uses instant picture technology to make prints from slides or negatives with only one processing machine. However, at present this system only works with Kodak products and is relatively expensive. For the present, the colour processing drum is still the simplest and most economical way of making prints from your colour slides and negatives.

Built-in motor *Some sophisticated processors have a built in motor and thermostatically controlled water bath to keep the temperature steady*

Copying pictures

By carefully photographing a painting, drawing, or faded photograph, you can produce transparencies of it for projection, or any number of identical copies in colour or black and white

Dave King

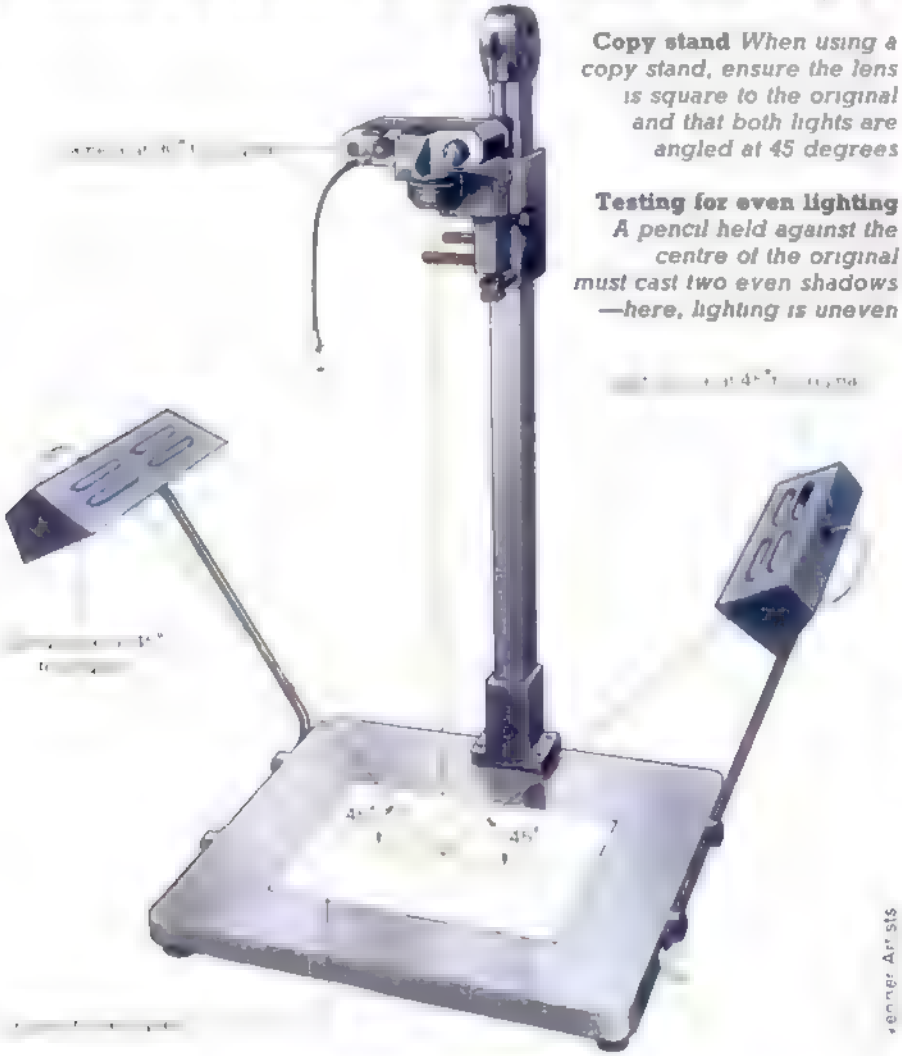
Horizontal copying *If you do not have a copying stand, or if your subject is too large to be copied from above, pin it on a flat wall square to the camera*

Equipment and lighting

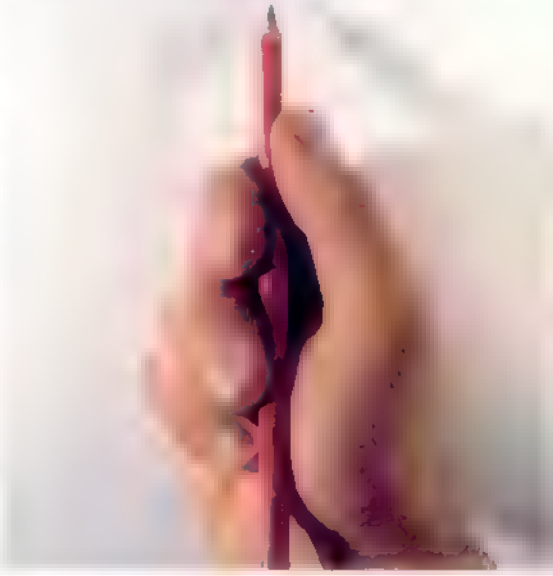
Colour control *A grey scale and a set of colour patches make printing easier when you are copying in colour*

Dave King

Grey card *For accurate exposure regardless of subject tones, take a meter reading from a standard grey card*



Copy stand *When using a copy stand, ensure the lens is square to the original and that both lights are angled at 45 degrees*



Testing for even lighting *A pencil held against the centre of the original must cast two even shadows —here, lighting is uneven*

Jenner Artists

[illegible]

[illegible] when used with colour film

Film and exposure

The most suitable type of film depends on what you are copying, the [illegible] you are using and the final use to which you plan to put the copy [illegible] or do you want a print

If you want to produce a copy in colour from a colour original [illegible] to use transparency film. However, you don't [illegible] to print or project [illegible] colour negative film can be used to make a rough copy print, but does not give as good results as colour transparencies. Professional colour copies for publication are shot on special [illegible] film

[illegible] be kept [illegible] exposure [illegible] If you are using [illegible] to illuminate the original [illegible] any [illegible] daylight type film. [illegible] the finest [illegible] and [illegible] involves [illegible] the film to [illegible]

If you are going to make prints from the copies it is worth [illegible] a set of printed colour patches and a grey step wedge. Include these at the extreme edge of the frame within the picture area when taking the pictures. They will appear in the final print but can be easily trimmed off. The purpose of these patches is to provide a standard reference for colour balance and exposure at the printing stage. When the printer does not have access to the original subject they must [illegible] to judge when colour balance is correct.

In black and white [illegible] you should use depending on what you are photographing. [illegible] colour originals should be photographed on fine grain panchromatic film such as Panatomic X, but black and white originals may need special treatment. They can be divided into two groups line and continuous tone.

Line originals consist of solid black areas and clear white paper with no shades of grey in between. Into this category fall engravings, pen and ink drawings [illegible] of type, [illegible] scripts and [illegible] that [illegible] white which [illegible] dot pattern [illegible] line material. [illegible] copied [illegible]

Dave King

Pictures under glass *Prevent reflections from a glazed original by covering the camera with a black cloth or card*

Pictures on the wall *If a picture does not hang vertically, measure its angle and keep the camera parallel to it*

Special problems

When your original is perfectly flat, in good condition and non-reflective, you should have no difficulty in copying it. Unfortunately, few originals are that simple, and you may have problems with certain types of subject.

Glass You may sometimes need to copy a subject behind glass. This is not easy, because glass is slightly green in colour, and can reflect the camera and copy lights. To get round these problems, position the lights so that they illuminate the original at a more oblique angle, and do not illuminate the camera lens. Take great care, though, that illumination still remains even.

The reflection of the camera can be eliminated by cutting a hole in a large sheet of black card or material, and poking the camera lens through this. Watch out for your own reflection, too.

You may not notice the green colour of glass at the time of exposure, but to prevent it colouring your copies, use a light magenta filter over the camera lens. Five units of colour correction is a good starting point to begin practical tests.

Copy not flat Bent or curved originals can sometimes be held flat using drawing pins to hold them down to the copy board, but if this fails, try holding them flat overnight under books. If this does not work, dry mount the originals on heavy board. As a last resort, hold them flat under glass, but pay attention to the comments above.

Books If you have to copy a book, use a vertical copying stand, and support the cover at one side with another book, or a foam block. Use a rubber band to prevent the pages from flicking over. If it will still not stay open flat, weight it down with a sheet of glass, but again, beware of reflections.

Stains and fading Old photographs are frequently marked with dark or pale stains. There is no way of removing them if you are making a colour copy, but in black and white you may be able to filter them out. If the stains are yellow on a pale area, they can be eliminated by a yellow filter on the camera lens. If there is yellowing in a dark area, a blue filter can sometimes be used to darken this. The general rule for black and white film is that a coloured stain can be eliminated by a filter of the same colour, and darkened by a filter of a complementary colour. Remember that filters lengthen the exposure time.

Paintings hanging on a wall It is rare to find a painting that hangs parallel to the wall. Either wedge the bottom of the painting until it does, or tilt the camera until the film is parallel with the canvas. This is made easier by using a clinometer —an instrument that allows you to match the slope of the painting and camera.

Non-SLR camera If your camera is not an SLR, the taking lens sees a different view from the viewfinder. Before putting film in the camera, open the back, and put a small piece of tracing paper over the film gate. When the lens shutter is set to 'B', an image of the original is projected on to the paper, and you can adjust framing from this image.

Uneven reflective subjects Oil paintings that have a glossy uneven surface can be very difficult to copy, because each ripple of paint picks up a bright highlight. The only certain solution is to use a polarizing sheet filter over each copy light, and another polarizing filter over the camera lens. If the plane of polarization of the filters on the lamps, and that of the filter on the lens are at right angles, all unwanted surface reflections will be cut out.

There are several disadvantages to this system—tungsten lights get very hot and can burn the filters, a considerable amount of light is soaked up by the polarizing sheets, and the cost of the polarizing material itself is high. Try and avoid resorting to polarizing filters if at all possible. The principle of eliminating reflections using polarizing filters is described in detail on page 1030, but the effect is visible through the lens.

Vertical copying *You may be able to reverse your tripod column and use it as a vertical copy stand*

Eliminating stains *The original of this picture was spoiled by ink marks. Copied in the normal way, this showed up as a dark stain, but with a red filter fitted over the lens, the mark was eliminated from the copy print*

Kodalith. If it is processed correctly—as shown in pages 914 to 917—this film reproduces everything as either black or white and completely eliminates grey tones. While lith film is available in 35 mm. form, other high contrast line films are only available in sheet film. For occasional copies it is possible to cut thin strips of sheet film and to load them into the camera in the dark.

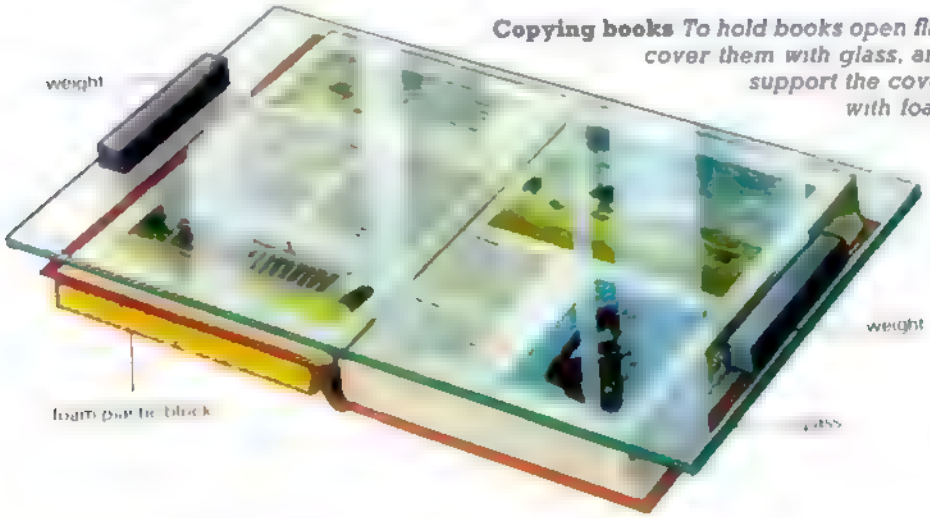
Instead of using line film you can use conventional film and increase development to raise the contrast level. Printing on hard paper further increases the contrast.

The term continuous tone covers all other black and white subject matter and includes everything that has shades of grey which must be correctly reproduced. Photographic bromide prints are continuous tone as are drawings, quality book illustrations, pencil sketches and so on. All this material can be copied effectively on ordinary fine grain film.

If you want to project your black and white copies as slides you can either use a special reversal film such as Agfa Dia direct or if this is not available use ordinary fine grain film and reversal process it (see page 926) to slide.

Whichever film you use exposure metering is always done in the same way—either take an incident light meter

Copying books *To hold books open flat, cover them with glass, and support the cover with foam*



reading with a separate hand-held meter or place an 18 per cent grey card on the original and take a reflected light reading from this using your camera's TTL meter. Always bracket your exposures to make sure that you get one exactly right—this is particularly important with line and slide film.

Contrast tends to rise in copying and for black and white you may need to adjust the exposure and development in order to retain all the details in the final copy. Trial and error is the only way to determine what changes are necessary, but a good starting point is to give one stop extra exposure and cut the development time by a quarter.

Werner Artists

Bringing home the world

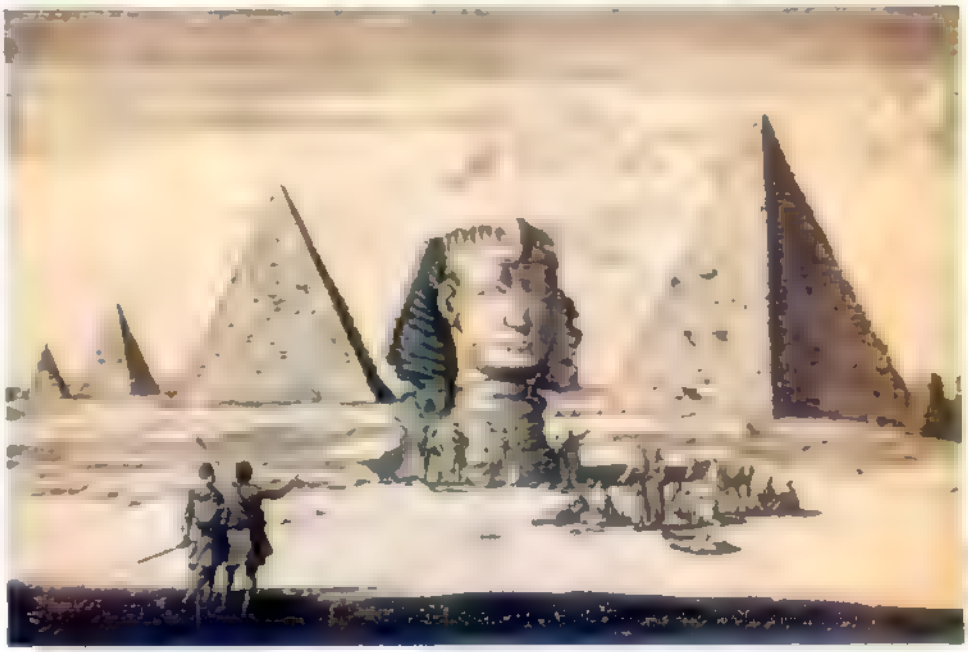
In the mid 19th century the growing middle classes were eager to see pictures of faraway lands and other cultures. This was to be satisfied in a new and exciting way by the emergence of the travelling photographer

Most people today are far more used to scenes from foreign lands. [illegible] and magazines [illegible] from around the world [illegible] is [illegible] to see [illegible] people [illegible] Africa.

Yet in the 19th century [illegible] were unknown to the [illegible] of people. [illegible] thirst for knowledge of what the world was really like, a new breed of photographer was born—the professional travel photographer.

Before the invention of the daguerreotype in 1839 there was a thriving trade in topographical drawings. These popular prints were often [illegible] based on the [illegible] travellers' tales and [illegible]

Photography by [illegible] a sense of wonder with its [illegible] image. The Victorian public [illegible] offered [illegible] glimpses of far flung places [illegible]

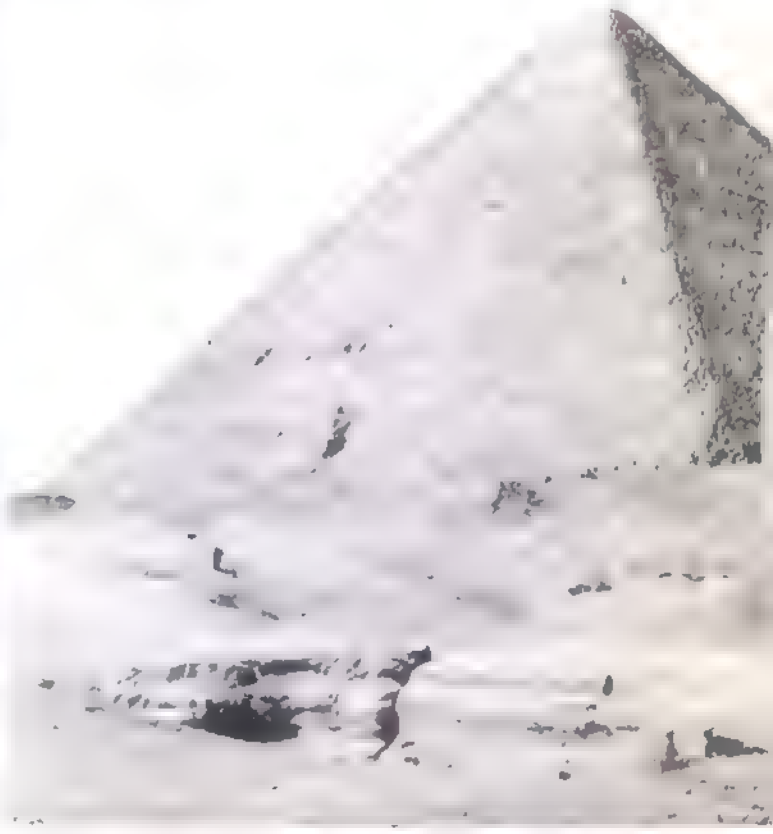


Mansell Collection

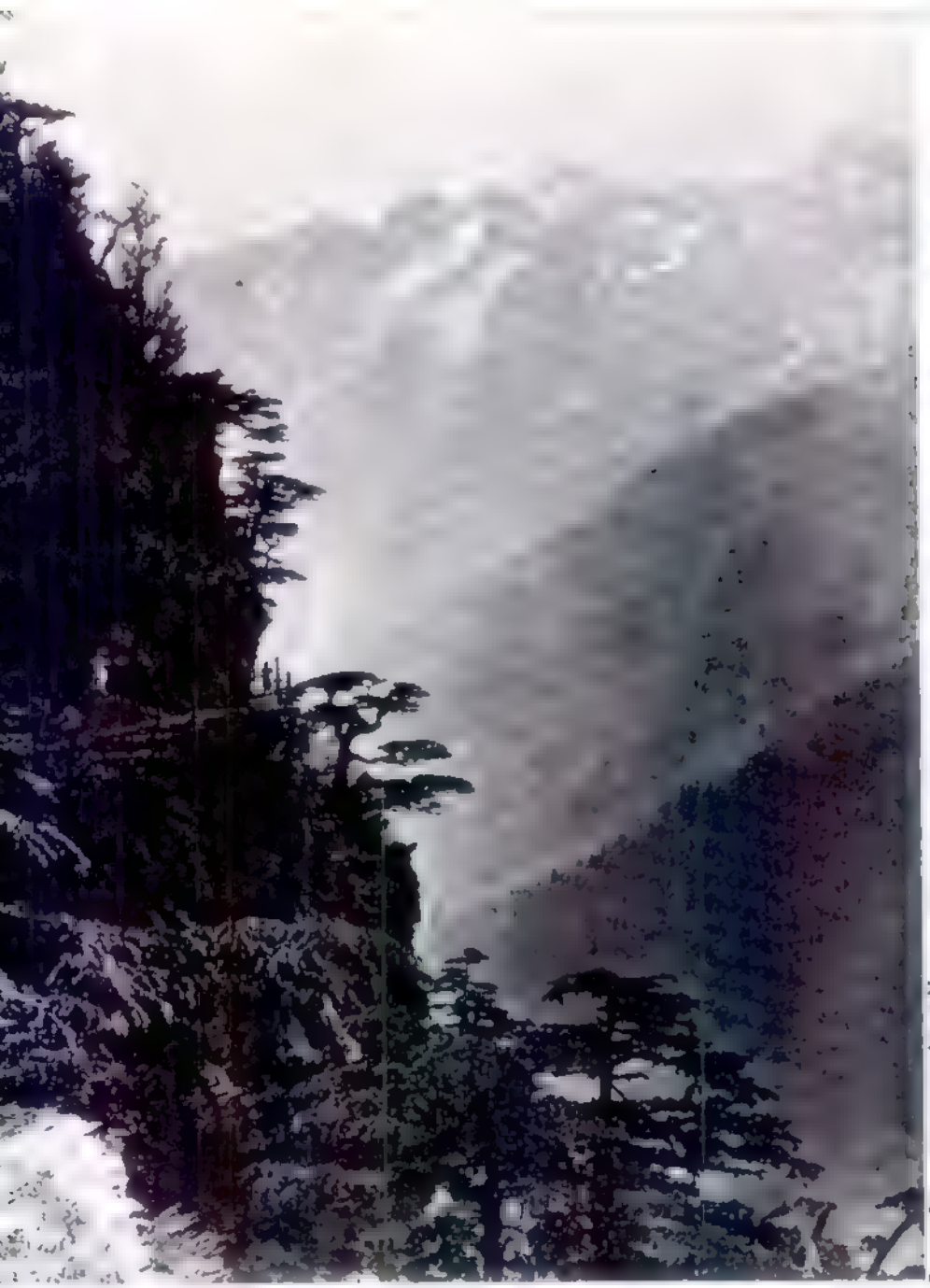
The Sphinx and the Great Pyramid, Egypt *Francis Frith's photograph (below), taken in 1857, shows the absurdity of the more fanciful artists' impressions that were produced before the advent of photography*

Howarth-Loomes Collection

Family viewing *Looking at stereographs became such a popular pastime in late 19th century England that it has been described as the 'Victorian television'*



Francis Frith, Mansell Collection



Samuel Bourne Victoria & Albert Museum

Himalayan landscape *Samuel Bourne took this magnificent scene in 1866 during his third trek to the Himalayas with a vast load of chemicals and equipment*

Photographing the frontier *The small boat in the foreground was used by O Sullivan during his extensive travels through America after the Civil War*

Timothy O Sullivan Courtesy George Eastman House

Eadweard Muybridge Science Museum, London

Tlingit Indians *Muybridge's photographs of the north west coast Indians are some of the earliest ethnographic pictures ever taken in this area*

Physic Street, Canton, China *One of the illustrations that John Thomson used in his book 'China and its People'—the result of several years travel*

the Parthenon and the Alhambra a Moorish palace in Spain.

Europeans felt a particular fascination for Africa and the East and especially for those countries with historical colonial connections. The imperial concerns and attitudes of the photographers and their audiences were often clearly reflected in the resulting pictures, making them unique documents.

One of the first photographically illustrated books which used the calotype process was *Egypte, Nubie, Palestine et Syrie* published in 1852 with photographs by Maxime Du Camp. Together with the writer Gustave Flaubert Du Camp was commissioned to record the monuments of the Near East. Travel was a hazardous business at the time. Just before they left Du Camp found Flaubert solving his never-ending homesickness and again. However they returned safely, and the book was a great success.

As landmarks became more familiar and photographic equipment improved and became easier to use, the photographer-explorers began to look more closely at people and their customs: foot nail clipping in China, the women of Morocco, South American Indians and details of daily village life in Russia found their way to the Victorian parlour.

The stereograph became the rage as the drama of landscape was enhanced by its three-dimensional effect. It sold in millions from the 1850s to the 1930s on both sides of the Atlantic.

Most photographers made stereo pictures as well as larger images and some carried several cameras to take the same view in different formats. Eastern

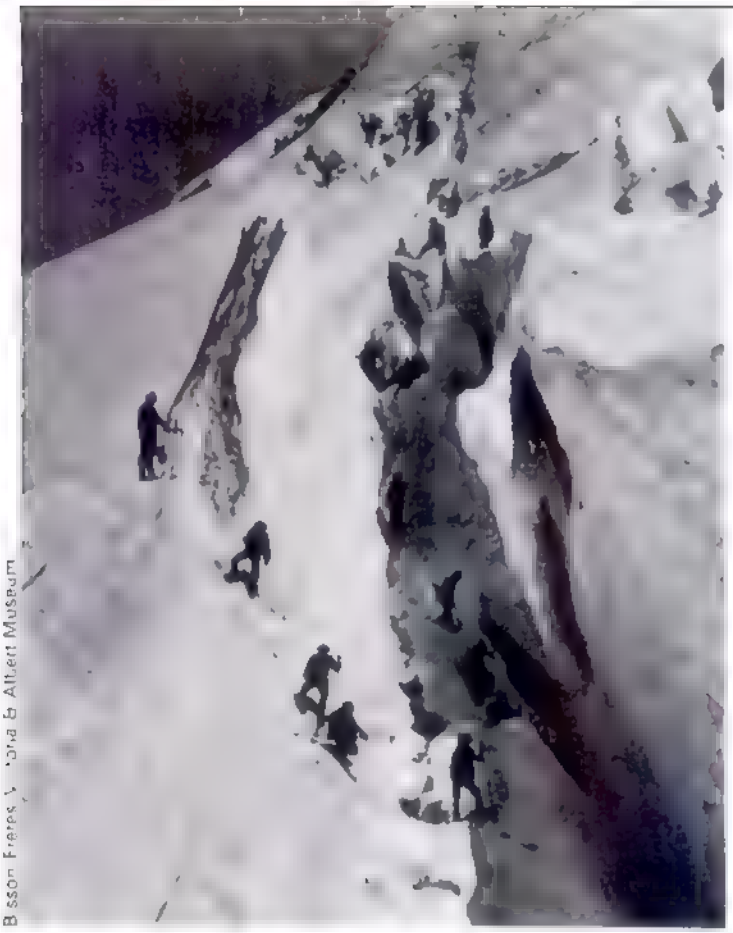
John Thomson The Royal Geographic Society, London

James Robertson, Victoria & Albert Museum

Street scene, Constantinople *Robertson took this picture of the Imperial Gate of Seraglio in about 1855 while travelling through Turkey with Beato*

Lao village, Siam *Thomson took this picture on a six month trip through Thailand to Cambodia (Kampuchea) in 1866 photographing the land and people*

John Thomson/The Royal Geographic Society, London



Bisson Frères, Victoria & Albert Museum

A crevasse in the Savoy Alps, 1860 *By Louis and Auguste Bisson who were summoned by Emperor Napoleon III to accompany his climbing expedition through the mountains*

Courtesy George Eastman House

Timothy O'Sullivan *A self portrait of the great American landscape photographer taken during the year long Selfridge expedition to the Isthmus of Darien (Panama) in 1870*

[illegible] photographer [illegible] had to be [illegible] there. [illegible] yet [illegible] photographs. [illegible] it was too windy. On the second [illegible] Silver bath, learned that it was only at the third attempt that everything worked. Lovely. On another occasion his pack mule Gimlet fell and broke most of his plates.

Pack animals seem to have been a particular problem. Samuel Bourne had a similar experience as he toiled on his Grand Canyon trip. The horse bearing the camera box of a staff fell landed on top of the camera with a result that need not be described. Other hardships included temperatures which made chemicals almost too hot to use, vicious mosquitoes and mountain air. The unfortunate early wet plate photographer Ridgeway Glover was found after he had been scalped, killed and mutilated by Indians.

Although some European photographers used large plate sizes – Frith made 16 × 20 inch views of the desert – it was the Americans who pioneered the use of mammoth plates. As William Henry Jackson said of his 21 × 24 inch views of the Rocky Mountains: They convey an impression of the real grandeur and the magnitude of mountain scenery that the smaller views cannot impart.

Other significant photographers of the era were the British photographer Eadweard Muybridge (see page 944) and the American Carleton Watkins who at that were partners and their rivals.

Muybridge is famous for his work on [illegible] and human locomotion but [illegible] photography was [illegible] that the [illegible] part. He published over [illegible] including [illegible] Muybridge's early views have [illegible] printed in from a separate negative to counter the dark white skies caused by the excessive sensitivity to blue light of the early plates. Later both he and Jackson succeeded in [illegible] and [illegible] satisfactory [illegible] explorer.

Watkins went to California during the [illegible] and [illegible] work produced [illegible] the Yosemite Valley. [illegible] views of the newly discovered Yosemite Valley.

John Thomson and Francis A. Bedford were among the many photographers who documented the life and customs of the people and the landscapes in the countries they visited. Bedford first worked in partnership with James Robertson, Chief Engineer to the Royal Mint at Constantinople with whom he photographed Malta, Egypt and Alexandria. Bedford went on by himself to India and China to Japan, where he produced some of his finest work. Thomson photographed extensively throughout Indochina, Cyprus, Constantinople and China. He produced several [illegible] text and photographs based on his travels. The best known of which are the four volumes of *China and its People*.

Timothy O'Sullivan, a photographer in the American Civil War, was one of the most experienced survey photographers. He took part in several [illegible] expeditions including Clarence King's [illegible] Exploration of the Fortieth [illegible] [illegible] photographs [illegible] of the [illegible] [illegible] by the [illegible] they had been [illegible] and [illegible] photographers had to [illegible] their self-portraits.

The heyday of landscape and topographical photography lasted [illegible] the period from the [illegible] to the [illegible] in both Europe and America. From this time the [illegible] of the dry plate gave way to the wet plate [illegible] experience. It was [illegible] photographers [illegible] [illegible] the wet plate [illegible] [illegible] the dry plate also [illegible] [illegible] the people [illegible] [illegible] photography. It [illegible] with the [illegible] of better [illegible] and the [illegible] [illegible] where the [illegible] [illegible] [illegible] the world for their [illegible] [illegible] [illegible] [illegible] rather than [illegible] [illegible].

The invention of George Eastman's Kodak box in 1888 (see page 761) meant that travel photography came within the reach of anyone. Eastman himself [illegible] for his product's success in [illegible]. Anyone who has [illegible] [illegible] to travel [illegible] and prove a [illegible] now [illegible] [illegible].

Assignment

Whitewater canoeing

Wild water, dramatic action and plenty of colour are just a few of the attractions of a white water canoeing assignment

The power of a fast moving river, the sun and strength of the [illegible] the [illegible] atmosphere of an international sporting event [illegible] make a world [illegible] white water canoeing event a promising photographic subject.

Such events invariably take place in attractive rugged areas of [illegible] so the photographer who decides to cover this sport often has the added bonus of being able to mix action with beautiful rural settings.

Having covered [illegible] as far afield as Nepal, Jerry Young had a good idea of the main problems he was likely to face at the World Slalom and World Water Canoeing Championships in Bala, Wales. The main attraction with this sport are finding a viewpoint which offers a good angle for photographing the fast moving subjects and reacting to the action quickly so that the images are sharp and correctly exposed.

Jerry spent the whole of practice day walking along each side of the course exploring all likely spots for photographing a good mix of the racing [illegible] the river. From [illegible] particularly [illegible] the [illegible] of water [illegible] which [illegible] to [illegible] the sport. [illegible] Kevin [illegible] white water [illegible] that he [illegible] the right view of the action.

[illegible]

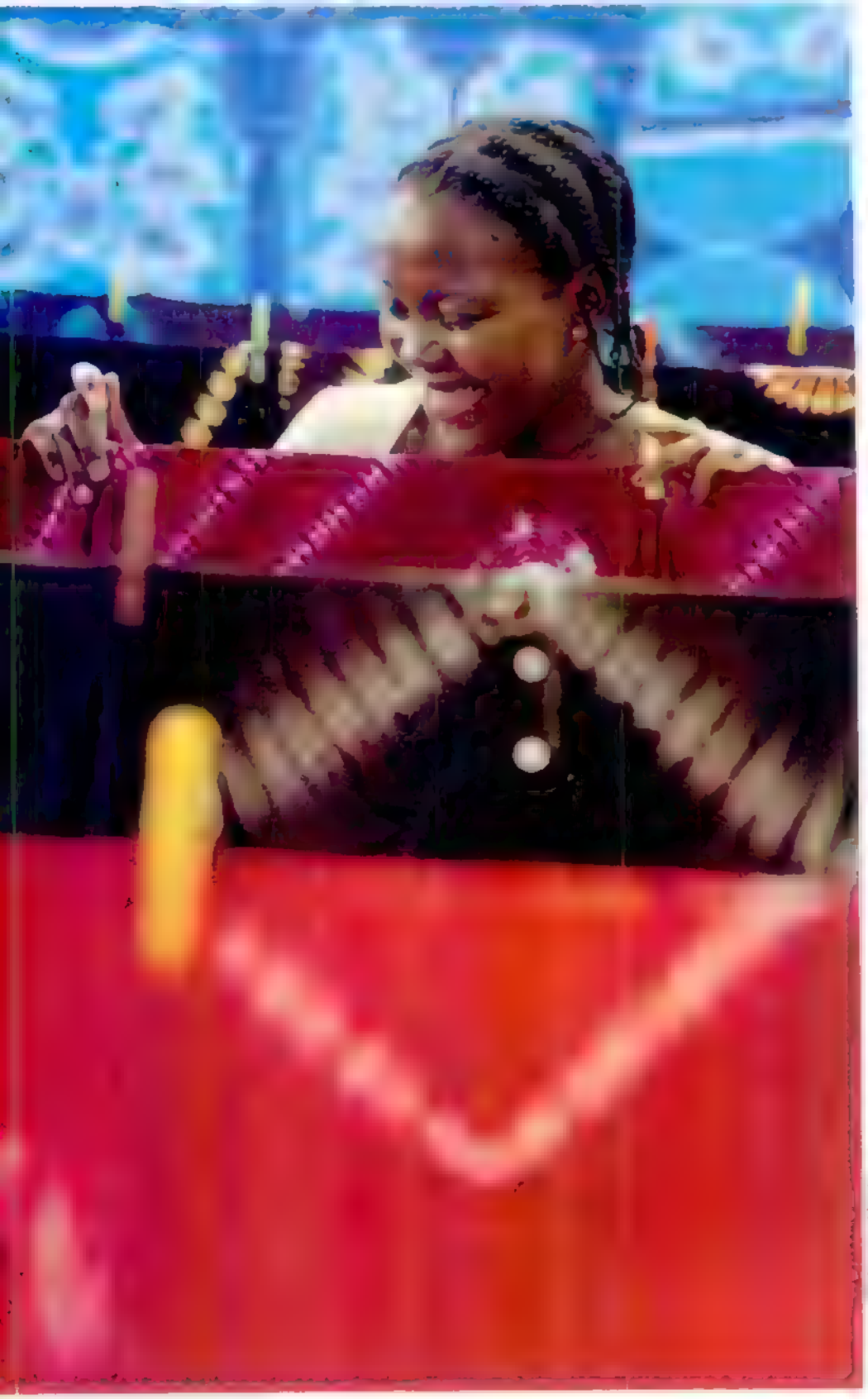
Jerry Young

White water *The beautiful setting of waterfalls and trees add an extra dimension to the action. The bright colours of the canoes and the clothing also enhance the scene.* **Over the waterfall** *Jerry prefocused on the waterfall and waited for a canoeist*

Upside down *Jerry was constantly on the alert for a moment of drama like this shot of an upturned canoe and a struggling canoeist* **Determination** *A view straight from the front is particularly spectacular—this shot was timed so the power in the man's arms and the expression on his face create a sense of tension* **Walking back** *Always looking for interesting details Jerry found some of his subjects out of the water* **Action** *A fast shutter speed is necessary to freeze the movement of water, as in this close-up view which really conveys the dynamic qualities of the sport* **Closer still** *A lens as long as 300 mm is essential for detailed shots such as this dramatic view of a competitor ploughing through the water*

People at work

Taking pictures of people earning their living in everyday jobs is a neglected field of photography. With the right approach, people at work offer a surprising amount of interesting and unusual material



Clothes pegs *Choose your viewpoint carefully to make the most of an attractive setting like this one*

Girders *Industrial photography can be difficult to arrange but the results can be quite spectacular*

Tailor *People who are proud of their work are usually happy to pose for a picture session*

The first visit is particularly important because, besides [illegible] for yourself you will also be [illegible] observation. The way that you respond to people you meet for the first time and the [illegible] you show by the work they do will greatly influence the photographs you will be now [illegible] up for a future time. [illegible] you will get [illegible] own photographs when you return to shoot the portraits. Even longer for example you will [illegible] the operation of [illegible] and patients. While in a factory you will need the foreman or [illegible] permission and the workers' [illegible]. Only if your friend is self-employed, a [illegible] or craftsman for instance, will you be dealing only with a single subject.

Generally most people are less self-conscious about their work than about their private lives. They also feel that work is a fit and proper subject for photographs. If you are photographing someone who is involved with their work they will usually expect you to be [illegible] their attention, as the job rather than the worker, and at a second

Robin Laurance

John [illegible]

they will be far less embarrassed than they might be in a straightforward portrait session. And your subject is in his or her natural surroundings and at least partly absorbed in normal activities. In these conditions you have a much better chance of an interesting and [illegible] photograph.

People working offer good subjects for photography partly because their attention is directed towards the job in hand and not towards you and partly because you can make the setting and activity a central and dominating part of the photograph. Most people love a chance to show their work and some even feel those who do not appreciate or understand it. Those who are shy that they can look off. A good deal of the

The yawn *Desk work provides few points of visual interest – so make the most of the human element*

satisfaction that such people gain from their jobs is in their pride in application of what they do and in these cases your photography was actually the work [illegible]. If you are [illegible] to pose in front of the lens for instance you will probably relish a good [illegible] and a [illegible] result.

However if you want to be more [illegible] you must see what [illegible] in relation to their work. The [illegible] the activity and as a subject [illegible] [illegible] of the [illegible] the [illegible] [illegible] of the trade [illegible] a [illegible] with the engine [illegible] and [illegible] Automatically [illegible] the [illegible] with the greatest detail even if they are only involved with the [illegible] of a part of it. Where the [illegible] involved [illegible] to [illegible] it is [illegible] that [illegible] it is a [illegible] a [illegible] [illegible] a [illegible] [illegible] of [illegible] [illegible].

You might consider [illegible] of work portraits in a particular [illegible] strongly different [illegible] with a single treatment. Because such photographs are portraits rather than studies of a particular method of working it is possible to impose a deliberated type on them. The method frequently employed by photographers and newspaper [illegible] is of a wide angle lens to show the [illegible] usually including in front of the workpiece with the [illegible] in the background. The advantage of this technique is that you can give as much [illegible] as possible about the work in your photograph.

[illegible] would be to concentrate on working clothes and conditions. Perhaps including just the [illegible] and tools of the trade to show the activity. On the other hand there are many [illegible] results which are [illegible] because of the seals and [illegible] involved. If you choose a subject that you are particularly interested in you may even learn something in the process. For example you want to find out exactly how [illegible] is brewed, or how an expert [illegible] fillets a fish, or how power [illegible] are trained.

Showing the development of a particular job needs a different approach. In most cases you will not be able to show everything in one shot and so you will have to work out a sequence showing the steps needed. A certain amount of [illegible] and for each

Fisherman *Using a wide angle lens enables you to include as much of an interesting, if cluttered place of work as you can. Ask your subject to help you rearrange things to make a pleasant composition*

Casino *Attractive or glamorous settings do not guarantee good shots. Further, if the lighting is dim the use of flash may cause problems, especially if discretion is needed to avoid disturbing your subjects*

Peacocks *If the work is particularly unusual, make sure your picture shows clearly how it is being done*

Hyperfocal distance

Depth of field is an important feature of image formation. One aspect in particular, known as the hyperfocal distance, can be extremely useful in controlling the overall sharpness of a picture

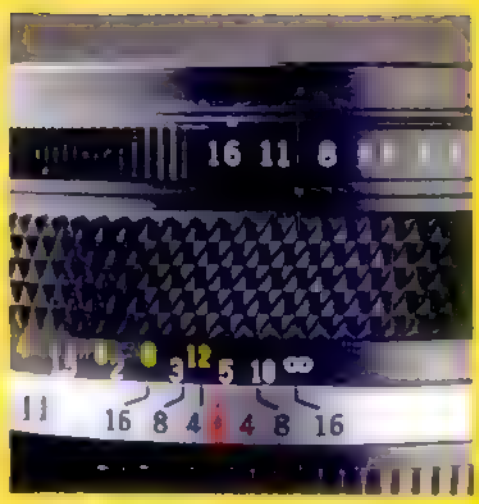
Robin Bath

Maximum depth *Sharp focus extends from near objects to infinity with the lens focused on the hyperfocal distance*

Standards of sharpness

Lens at infinity *With the aperture set at f/8, the depth of field index mark for this value indicates the hyperfocal distance—in this case, 10 m*

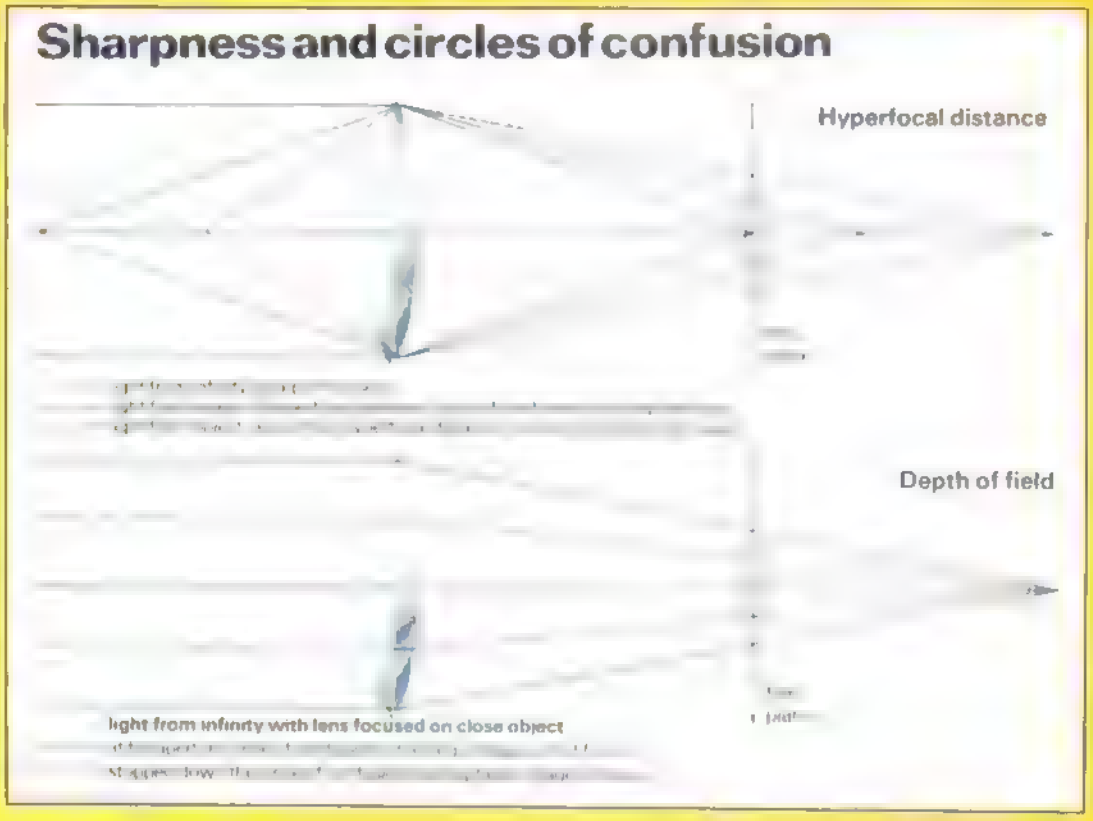
Lens at hyperfocal distance *Still at f/8, the infinity mark is moved to the index for this stop, so giving maximum depth of field for this aperture*



Stopped down *Changes in aperture alter the hyperfocal distance, which, at the smallest stop, gives the maximum possible depth of field for the lens*

Criteria for sharpness *The image of a point appears to be sharp if the circle of confusion it forms is below a certain size. In the lower diagram the lens is focused closer than infinity. But a point at infinity is sharp when the lens is stopped down*

Sharpness and circles of confusion



Calculating the distance

World of photography

Marc Riboud

In a career spanning over 30 years, Marc Riboud has established himself as one of the world's most highly respected and influential photojournalists

Peking, 1965 *The distinctive doors and windows of the Liuhchang, or antique dealer's street, have been used to frame this charming street scene*

Ferryboat, Vietnam, 1975 *(right) Taken to show the clear physical differences between the people of the north—the soldier—and the south—the girl*

The Great Wall of China, 1971 *During his frequent visits, Riboud noticed a growing enthusiasm for photography among the Chinese tourists he met*

Marc Riboud/The John Hillelson Agency

Naples, 1979 *From a photoessay on the city taken for the magazine GEO. Demonstrations such as this one are a recurring feature of city life*

Dubai, 1974 *VIPs being greeted at the airport, taken for the London Sunday Times for a story on the oil rich states of the Arabian Gulf*

Mar... R... d The ... H... sor Agency

After the death of Ho Chi Minh, 1969 *Women listen to speeches given at a meeting in Phat Diem in memory of the revered Vietnamese leader*

Rural Poland, 1980 *This picture of peasants working in a winter landscape was taken during Riboud's month-long tour of the countryside*

Carnival, 1979 *Rooted in ancient pagan festivals, celebrations such as this one in a small village south of Naples are held throughout Italy*

Painting the Eiffel Tower *The first of Riboud's pictures to be published, this image appeared in the early 1950s in the prestigious American magazine Life*

Fast lenses

Fast lenses made today boast maximum apertures which would have been unthinkable a few years ago. However, you must decide whether they are worth the cost in terms of bulk and weight, as well as expense

Fast standard

Wide angles

Ballet stage *A typical example of a situation in which a fast lens is a great asset. As flash photography is often forbidden in theatres, a fast lens is one solution to the problem*

Standard lenses *There is a great difference in size between the front elements of fast lenses and their slower counterparts. The larger lens has an aperture of f 1.2, the other, f 1.8*

Fast lenses (left) *You can buy fast lenses in many focal lengths. These range from 35 to 180 mm, and from f 1.2 to f 2.8. Not many photographers, however, could afford such a selection*

Fast telephoto *The faster the lens, the bulkier and heavier it becomes for a given focal length. This 180 mm f/2.8 lens weighs nearly one kilogram*

The floating element is [illegible] the focusing [illegible] of the lens. It moves separately from the other elements to improve performance at closer [illegible]. [illegible] elements, the floating element allows wide apertures in wide-angle lenses while avoiding undue deterioration in image quality.

Lenses of 35 mm focal length are available with apertures of f/1.4 and even f/1.4. Wider lenses, between 20 and 28 mm, can also have apertures of f/2, though such lenses are more difficult to make.

Fast wide-angle lenses have particular advantages over normal speed lenses of similar focal length. The shallower depth of field associated with each lens allows differential focusing techniques (see page [illegible]). This is often not possible with slower wide-angle lenses, their depth of field is so great even at full aperture. [illegible] that fast lenses are more popular even as normal [illegible]. However, sometimes it may be necessary to use neutral density filters, which cut down the light travelling through the lens without affecting its colour, to allow correct exposure with a wide aperture.

However, it is in the telephoto range that fast lenses have the most practical value because camera shake is very much more likely. A fast lens helps you to avoid this by allowing faster shutter speeds to be used.

Fast telephotos

For telephoto lenses, a wide maximum aperture is particularly useful. Because of the method of construction, telephotos cannot have very wide maximum apertures—a [illegible] mm lens with a maximum aperture of f/[illegible] is very fast. This means that even in fairly good light you may not be able to give sufficient exposure for a slow film. An extra stop therefore considerably increases the versatility of the lens.

Fast lenses are also valuable in the telephoto range because they allow the use of higher shutter speeds to avoid the effects of camera shake. This means they can be used [illegible] or for fast-moving subjects in conditions where a slower lens would not. This again increases the versatility of that focal length.

Larger aperture telephotos are particularly useful when a teleconverter is fitted. For example, when a 2× teleconverter is used the focal length is doubled but the aperture is reduced by two stops. With a fast lens, the viewfinder image is still reasonably bright and you can get a [illegible] correct exposure even in fairly low light.

Many long focus lenses in the [illegible] to 2[illegible] mm range have maximum apertures of f/2 or better. Typical examples are those from the Nikon range such as the [illegible] mm f/1.4 and [illegible] and 2[illegible] mm lenses, all with maximum apertures of f/2. Other manufacturers such as Canon, Pentax and Leitz have comparable lenses. A few also produce [illegible] f/[illegible] [illegible] and Canon [illegible] f/[illegible] [illegible].

For such lenses, the limits to large aperture performance are not set by [illegible] but rather by transverse [illegible] chromatic aberration (see page [illegible]). This aberration gives colour fringes to image detail and gets worse with increasing focal length. [illegible]

The [illegible] is [illegible] and [illegible] the [illegible] of the lens [illegible], [illegible] [illegible] LD [illegible] [illegible] [illegible] through [illegible] spread [illegible] as [illegible] that [illegible] chromatic aberration.

As fast long focus lenses are [illegible]. They [illegible] precise focusing as the depth of field, which [illegible] focal length, is very small at full aperture. [illegible] and it [illegible] with these lenses. This is due to the [illegible] and [illegible] the [illegible] depth of field [illegible] the point of [illegible].

However, with fast long focus lenses the [illegible] is a problem. [illegible] at [illegible].

[illegible] long focus lenses in the [illegible] mm range [illegible] very [illegible]. This was [illegible] the [illegible] and the [illegible]. [illegible] [illegible] with the [illegible].

Now, however, LD [illegible] [illegible] f/[illegible] [illegible].

The [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible].

Fast or slow ?

Choosing between a fast lens and the corresponding [illegible] is [illegible] a matter of [illegible] the [illegible] [illegible]. Remember [illegible] a fast lens is not necessarily a better [illegible] aperture [illegible] at the same focal length. [illegible] performance [illegible] [illegible] [illegible] [illegible] [illegible] [illegible].

[illegible] [illegible] aperture [illegible] [illegible] [illegible] [illegible].

Dave King. Camera Courtesy of Camera Craft

Fast lens plus teleconverter *Medium speed lenses become very slow when used with a teleconverter, but fast lenses retain an acceptable maximum aperture*

Concert audience *Shooting a moving subject in low light presents special problems. Here, a fast lens allowed the photographer to freeze at least some of the movement by using a faster speed than a slow lens would have allowed*

High key, low key

Choosing either a high key or low key approach to certain subjects can influence the whole atmosphere and mood of your pictures

In most photographs, there is an even range of tones from dark to light—any picture that shows a dearth of dark or light tones is generally under- or over-exposed. But by deliberately tipping the balance towards dark tones, you can produce a rich, moody *low key* picture. By keeping tones predominantly light, on the other hand, you can create a cool delicate *high key* effect. To get the best from both high and low key shots, though, you must choose your subject [illegible] fully and use special lighting techniques.

For an effective high key shot, you [illegible]ust choose a subject that is ve[illegible] [illegible]lour; for a low key shot, the subject must be dark. But the lighting must enhance these qualities. High key lighting is very flat and soft with few shadows whereas low key lighting is selective, and only the principal area of interest is brightly lit.

Traditionally, black and white film has been used for high and low key photographs, because it offers the photographer more control over the tonal range and contrast of the final image. Nevertheless high and low key images can be equally effective in colour. For high key work in colour, you must be careful in your selection of subject matter, because the high levels of [illegible]ing show up every slight difference [illegible]. Essentially high key shots [illegible] only one or two main [illegible]hite is particularl[illegible] [illegible] lighting, how[illegible] [illegible]guise colour differen[illegible] effective in colour.

High key treatment

High key effects can only be achieved with subjects that are predominantly light in tone—small patches of darker [illegible] such as dark eyes on a nude, do [illegible], prevent a [illegible] picture loo[illegible] pale and [illegible]. [illegible] for high key shots are [illegible]nd portraits, particularly where the sitter has blonde or light coloured hair, but still lifes can be equally effective. [illegible] interiors also work well if they [illegible]ery pale and sufficiently brightly [illegible]nly lit.

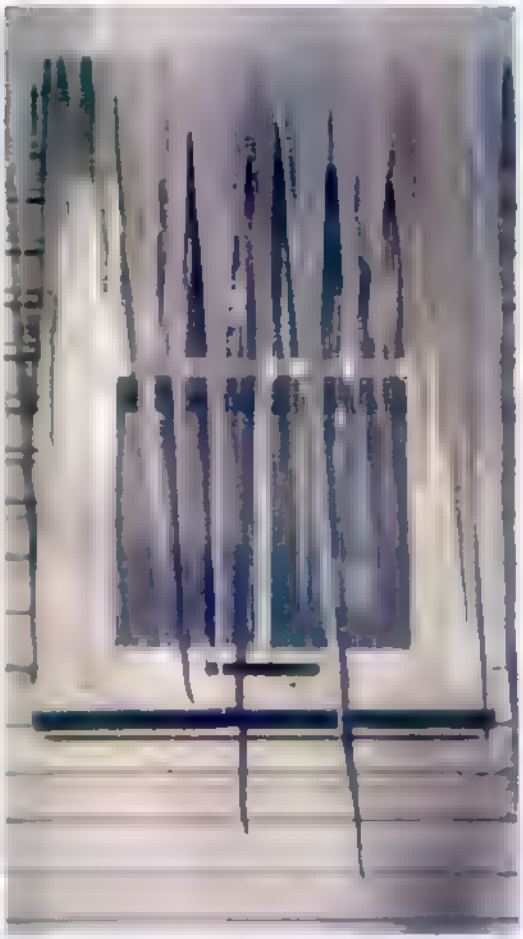
Out of doors, high key pictures are [illegible] more difficult to take because [illegible]s control over the lighti[illegible] and subject matter, but it is possible to produce effective landscapes under the right conditions. A fall of snow, for instance, can obliterate most dark tones from a landscape, and provide an ide[illegible] opportunity for high key pictures. Sand dunes and desert scenery also have possibilities.

Avoid any subject, indoors or out, that has large areas of dark tones. This more or less rules out dark-haired models, or at least makes the posing of them very difficult.

It is sometimes possible to conceal areas of dark tone by using *diffusion filters* on the lens (see pages 93 to 96). Because these spill light from the highlights into the shadows, they emphasize the high key effect, and work particularly well with figure studios and misty, romantic portraits.

Backgrounds for high key studio pictures must be similarly light toned. Seamless white paper makes an excellent background, providing there is enough space between the main subject and the background to light the background separately and eliminate shadows.

Winter whiteness *Cold weather is ideal for high key pictures. Obtrusive dark areas are blanketed by snow and ice, so it is an easy matter to shoot high key pictures out of doors. Best results are produced in overcast weather, when the shadows are soft and subdued—this is an important element of a high key treatment*

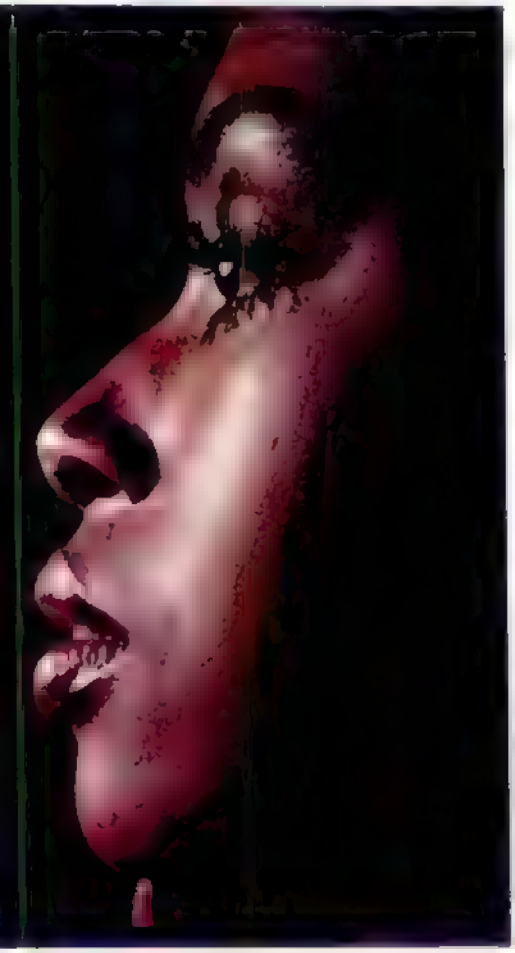


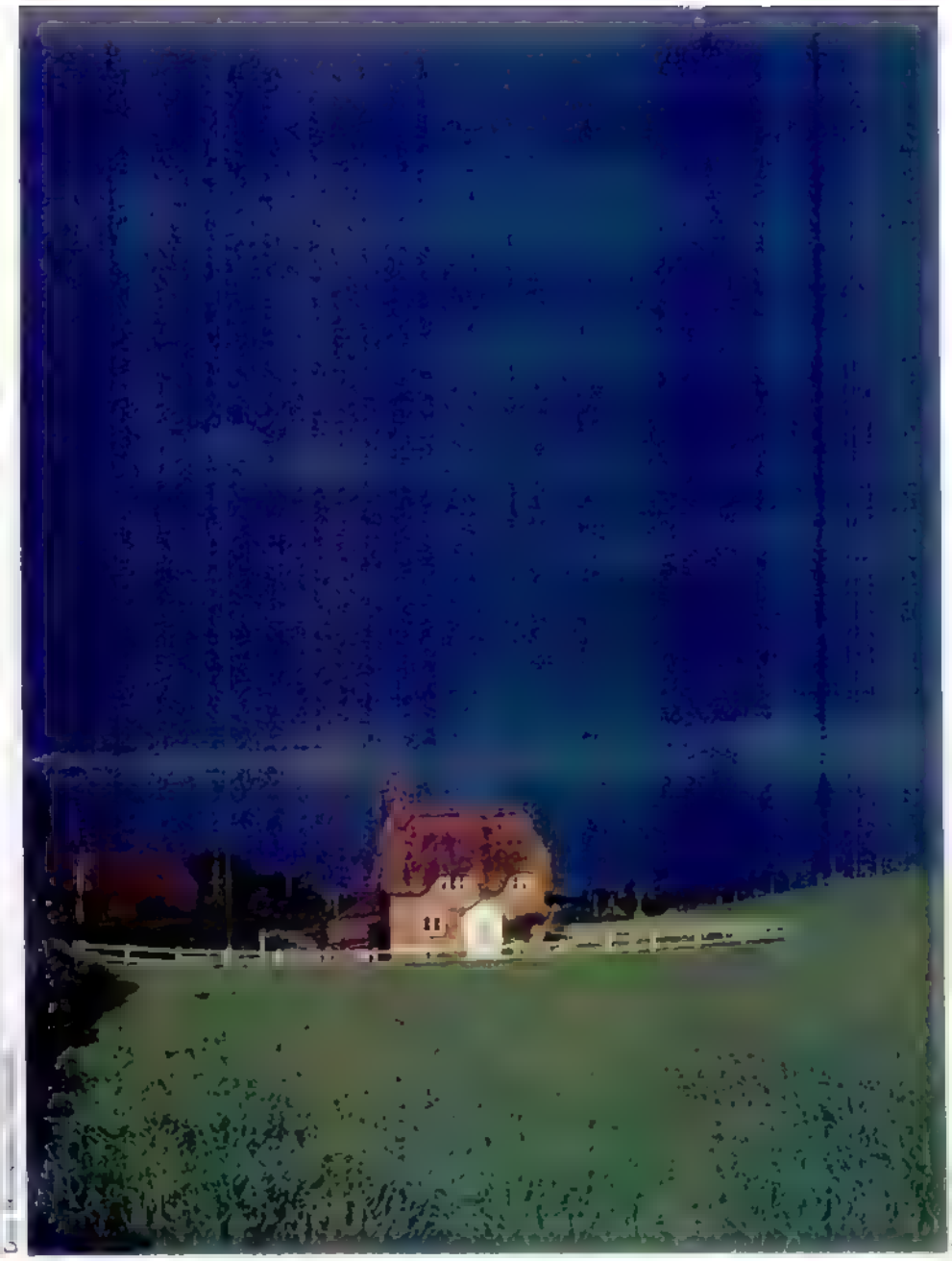
Hubert Bath

Lawrence Lowry

Dark landscape *The subdued colours and dark skies that you sometimes see after a storm provide a perfect opportunity for low key landscape pictures*

Low key look *A low key treatment works well for people with black skin but it is essential to use a hard light source to put in bright highlights*





Ann Ashley

Setting up the shot

The level of light for the background should be either slightly darker or lighter than the main subject. If both subject and background are exactly the same tone, then the two will merge together and the outlines of the subject will be lost. Bracket exposures under such circumstances and bear in mind that there is a small difference in brightness between the subject and its background.

Proper exposure is essential for high key work but it can be difficult to achieve. In case a further reading with a TTL meter would lead to under exposure. Since the subject is pale in colour and reflects a great deal of light, a reflected light reading would indicate too little exposure (see page 974).

For correct exposure an incident light reading is essential; that is, a reading for the light falling on the subject. This should ideally be made with a hand-held meter with a plastic diffuser dome in place. To take the reading, stand directly in front of the subject and point the meter at the camera. If you do not have a separate meter and rely on the TTL meter in your camera, use an 18 per cent grey card and take a reflected light reading from this. You should get the same result as you would from an incident light meter.

Whichever method of metering you use, it is a sensible precaution to bracket the pictures. In addition to the indicated exposure, make exposures at half stop intervals for two stops either side. This way you have a number of negatives or transparencies with slightly different densities from which to choose. If you are using black and white film, bracket at one stop intervals.

The film should be processed in exactly the same way as usual. Do not be alarmed by the appearance of the film as it comes out of the developing tank: negatives look very dense and slides seem to be overexposed. This is what constitutes a high key picture, and as soon as you examine the images carefully you will see that all the detail has been retained.

Low key pictures

Low key pictures need a generally dark toned subject, but if there are any pale areas in the subject or background they can often be concealed in shadow. The range of subjects suitable for low key treatment is therefore greater than that for high key pictures. In particular, it is relatively easy to achieve a low key effect out of doors, particularly when there is plenty of dark foliage in the picture.

However, before you aim for a low key image, make sure that it will suit the subject. It is easy to produce low key pictures that are inappropriately sombre and funereal, and have rather a depressing air. Only use a low key treatment if the subject is sufficiently full of life to override this, or if you are deliberately trying to capture a foreboding mood.

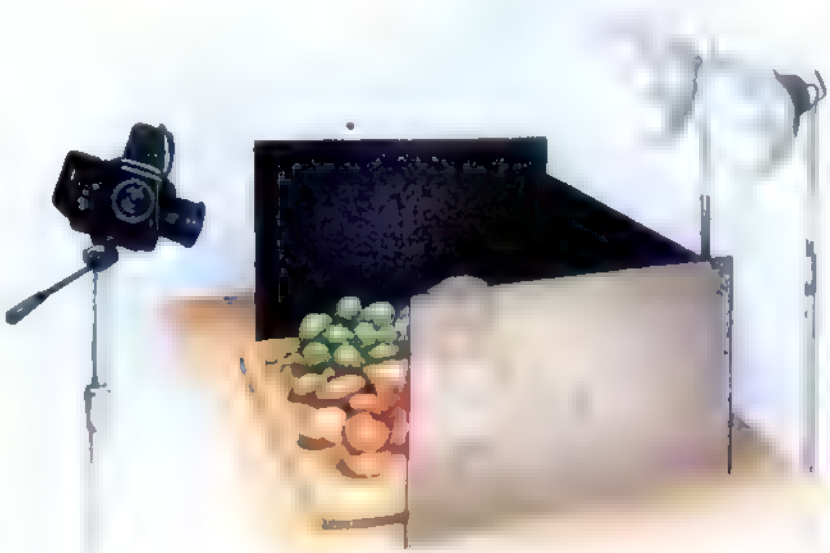
A low key picture is more difficult to light than a high key one, because the approach must be varied to suit the subject. Ideally, there should only be a small bright highlight—usually on the main part of the subject—and detail should be just visible in the shadows. Shape and form should be suggested and hinted at, rather than being emphatically stated.

Where texture needs to be emphasized—with fabrics, for instance, or a wrinkled face—a small hard light source should be positioned to bring out surface detail. If texture is to be suppressed, softer lighting may be more suitable, and light should be placed closer to the camera. In both cases, the main lights should be arranged so that light does not spill onto areas which are to remain in shadow.

The main source of light is used to create the highlight, but the rest of the picture needs to be lit by a very low intensity light source. This should not be bright enough to produce detail on the negative, or to lift the dark

Roger Payling

Low key lunch *The lighting for this still life was very simple. The photographer used only one light source, a sheet of tracing paper lit from behind by two powerful floodlights. The rich shadows that are a characteristic of low key lighting were created by shading the set using large pieces of black card. The centre of the picture was left unshaded and is much more brightly illuminated*



Oxford Illustrators

Roger Payling

portions of a transparency away from a solid black tone This overall illumination should be softened by bouncing the light off a white umbrella, or a sheet of white card or polystyrene

Once you have arranged the main light for the highlight and a second, soft light for the overall exposure, stand back and look at the scene If the shadow areas look too muddy and dark, you may need to provide gentle rim lighting to provide some separation of the planes in the picture. This can be sidelighting backlighting or toplighting, set so that the light just catches the perimeter or the subject, but does not illuminate the shadows—if the rim light is overdone the low key effect is lost

Exposure readings for low key pictures should be made in the same way as for high key, using the incident light method, or a grey card. Remember, though, to take the reading from the fully lit part of the subject, and not from the shadow areas Since low key lighting is even dimmer than high key, this is very important—bracket exposures to ensure good results

If your technique is right, you should be able to process and print low key pictures in the normal way Shadow detail is important, though, so if you are printing in black and white, concentrate on the shadow areas of the print

High and low key treatments are, first and foremost, creative techniques They are not an end in themselves, and they become monotonous if used over and over again Not all subject matter benefits from either of the two techniques and you need to use some discretion when picking out what to photograph Nevertheless, with the right subject, either treatment can produce an exciting, unusual picture

High key head
For this picture, the lighting was much more complex. The main light was the same sheet of diffusing material, but this time placed directly above the camera and lit by two photofloods. Plenty of soft fill-in lighting was provided by bouncing the light from two more floodlights off the white studio walls. The background, a roll of white seamless paper, was lit by floodlights on either side. Finally, a small floodlight on a boom was positioned above the model's head to lighten her hair still further, and this was covered by tracing paper to soften its beam. To prevent a deep shadow forming under the chin, the model held a large sheet of white polystyrene, which acted as a reflector, throwing some of the light up into her face

Oxford Illustrations

B&W reversal

Monochrome transparencies have deeper blacks and brighter highlights than prints. By reversal processing black and white film, you can produce your own high quality reversal images

Exposure

Rich tones *Subjects like this are especially suitable for black and white reversal, because their density range is reproduced in rich, full tones*

ed Buzak

Simon Jenkins

Still life *Agfa Dia-Direct gives warm, rich tones and reproduces detail well*

Imitation Tudor *Reproduced from a Kodak Panatomic-X film, reversal processed*

The reversal process

Girl in profile *This shot, taken on Ilford Pan F, shows good detail and a wide density range. Enlargment (below) reveals a moderate amount of grain*

Simon Jones

Bay window *This was taken on Agfa Dia-Direct monochrome reversal film, and shows the characteristic high quality obtainable with this film. Only when the image is greatly enlarged does the extremely fine grain become visible*

[illegible] to reduce [illegible] and this results [illegible]. [illegible] a bright [illegible] with a [illegible] density [illegible] to [illegible] enough light [illegible] the film where the transparency is required [illegible] the [illegible] level. It is a precaution worth taking.

After first development is complete, which is certainly after 2 minutes, pour out the developer and give the first wash. You are now ready to pour in the bleach. Timing is very important at this stage and to obtain good results you must [illegible] the film, for too long as this may affect the undeveloped silver halides.

[illegible] I find I know the bleach within [illegible] minutes. Some others [illegible] the bleach wash. The clearing bath neutralises the bleach and helps create consistent results.

Re-exposure

After the wash of the clearing bath, reversal processing departs radically from negative processing. Open the developing tank in normal room light, and remove the film spiral. You must now re-expose the film to develop the remaining silver halides. This is best done by leaving the film in the spiral close to a lamp for a minute or two in the same way as for Agfa colour reversal processing, (see page [illegible]). Most plastic spirals are translucent so the film need not be unwound. But if you have a stainless steel spiral, you must unwind it before exposing the film very carefully. Stainless steel spirals can also be retained when wet.

When you have re-exposed the film, return it to the processing tank for the remainder of the process. Like first development, second development is carried out the longer to turn as much exposed silver halide as possible into the final silver.

This step is followed by a wash and an ordinary hardening fixer. Then give the film a final wash, with a little wetting agent and hang it up to dry in the usual way. Be careful when handling the film up as the roughly abraded in processing solutions is likely to leave the emulsion softer than usual and so more vulnerable to damage from scratching or stain pieces of dirt.

[illegible] the film [illegible] cut up into its separate frames and mounted in transparency mounts.

Results

Results vary slightly according to film emulsion and the processing kit used. Slower films often give a slightly warmer image than faster ones, but this is usually attractive, and a brownish-black tone suits many subjects.

Slides which are too dense or too light are usually the result of incorrect exposure, but the length of the first development time can also influence density. Slides that are too light and contrasty may have been over-developed, while flat, dark slides have usually been under-developed. Staining or density variations are probably the result of inadequate washing between processing steps.

Other methods

You can also make black and white transparencies without a reversal processing kit. The easiest way is to use a roll of Agfa Dia-Direct or Kodak ASA film which is sold with processing included in the price. You expose your film, [illegible] and post it to the Agfa processing centre near [illegible], who will reversal process it into fine grain, high quality transparencies. The film has a higher [illegible] than most conventional films, so the slides are as bright as normal transparencies.

Another method which does not require reversal processing is to contact print a negative on to fine grain [illegible] film. This technique is covered in a [illegible] article.

Printing transparencies

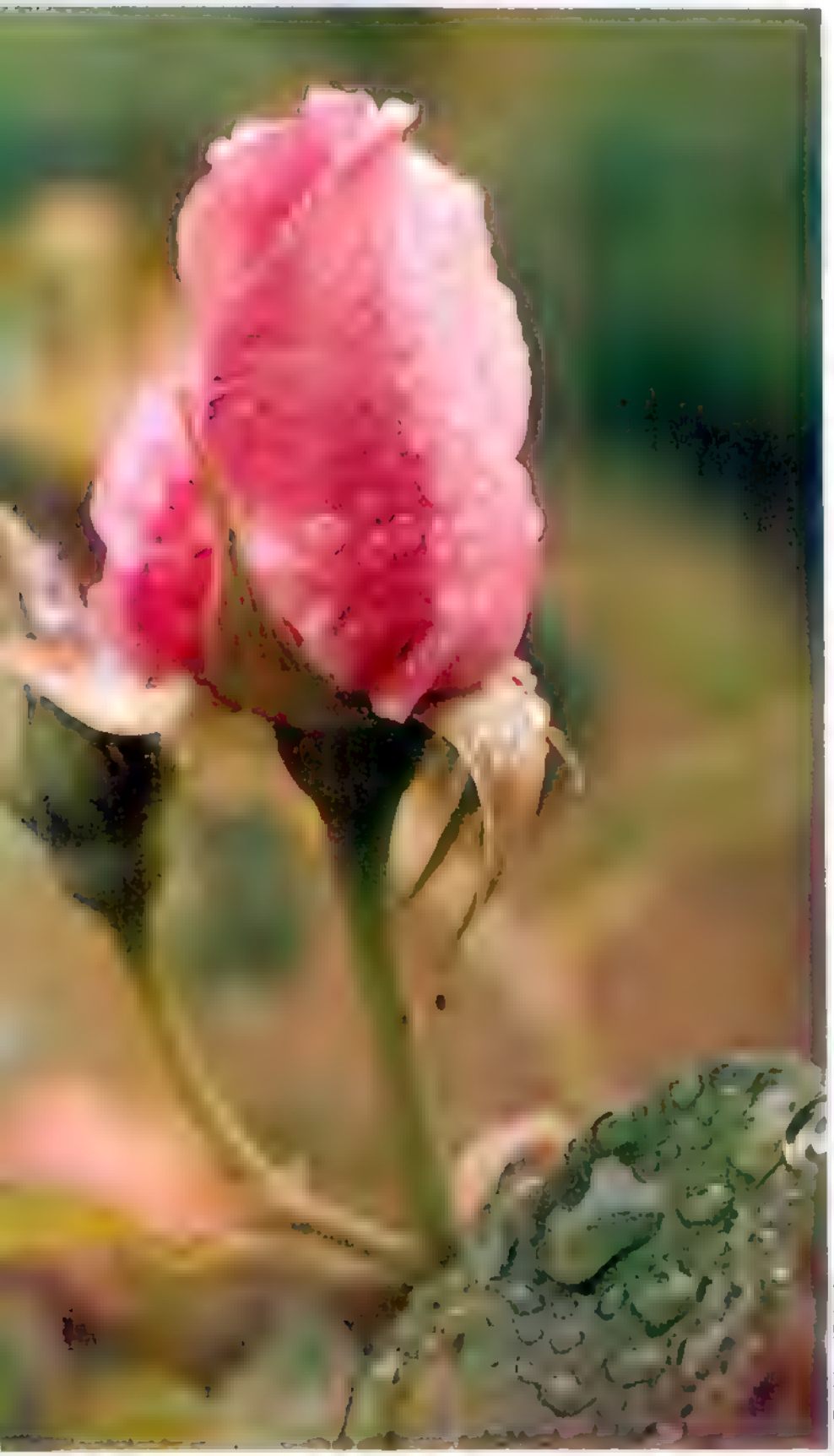
You can also print your transparencies on [illegible] of your own [illegible] processing equipment. [illegible] the paper. To [illegible] contact with the film, you should use a print processing drum. Alternatively you can print in Chromatone [illegible] the same way as with [illegible] transparencies, adjusting filter combinations for many different creative special effects.

You can also add colour to your transparencies by using a [illegible] or tints. Using a fine brush, and a [illegible] you can even add [illegible] very effective [illegible] with the [illegible] dyes. [illegible] a [illegible] special article.

Creative approach

Rain

Do not be discouraged by the prospect of a rainy day. Take your camera out and discover the potential of marvellous images in wet conditions



en Bradshaw/Colorific

Rosebud *Leaves and flowers look fresh and sparkling after rain, when tiny beads of water cling to their surfaces, and it is well worth taking close-ups*

towards a dark object

heavily the rain

is true if you want

in a photograph. The

requires a surp

last

difficult to give

of the light

raining very hard, you

the picture that there

raindrops as

effect quite unlike rain

are clo

Adam Woolfitt/Susan Griggs Agency

Open air concert *A rainy day is a good time for candid pictures, and may produce some amusing images*

Window *A normally dull view may appear to be much more attractive when seen through a screen of pearly raindrops*

John Goldblatt/Vision International

Vautier/de Nanxe

Rickshaw *Very heavy rain can be shown as streaks with a fast shutter speed but is best photographed from shelter*

John de Visser

Lights *Night lights in the rain, photographed through a window, form blurred, abstract images*

Sky *A dramatic skyscape often precedes a cloudburst, and in open country it is revealed at its best*

John de Visser

heavy [illegible] weather such as rain. [illegible] the [illegible] of [illegible] less vivid colours and lower contrast. When they result in [illegible] pictures [illegible] for brightly [illegible] colours as a contrast, such as yellow [illegible] raincoats, red traffic lights or bright green leaves. When the rain is falling fairly fast, people instinctively put their lights on. [illegible] for the last daylight, whether car lights or domestic lamps. You can use these to great effect in your photographs.

A rainstorm is not the best place for a camera and although a few drops of rain on the lens, or on the filter, will do no harm, you will probably prefer to carry out your rain photography from shelter. Raindrops on a window are a [illegible] subject in their own right, as a [illegible] part of a picture with some [illegible] of the rain.

The few minutes after heavy rain has stopped are frequently a rewarding time for photographs. There is [illegible] when you sometimes see a shaft of sunlight breaking through the fast-fleeting storm clouds and when the possibilities of extraordinary backlighting effects must be grasped before the combination of water and sun dries everything out. Dramatic rain [illegible] in to [illegible] scenes, however, and studies works for [illegible] more attractive photographs particularly when [illegible] so that the water glistens in the sunlight.

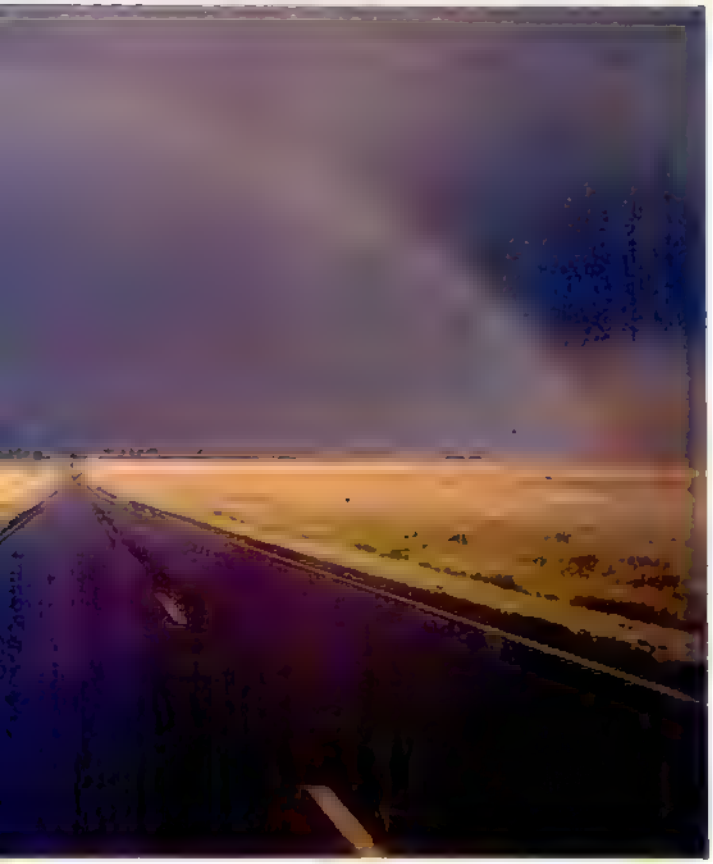
With these simple suggestions, it is worth trying a [illegible] and throw [illegible] the [illegible] attention [illegible] to the effect of the water. [illegible]

Umbrellas *The two figures in raincoats provide a centre of interest among the sea of umbrellas—they not only stand out but lead the eye in to the picture*

Rainbow *Capture the sweeping arc of a rainbow with a wide angle lens. Here the leaden sky and dark road provide a dramatic contrast to the rainbow itself*

Portrait *Try to capture the rare moment when someone is enjoying the rain. This classic shot combines the delicate droplets on the face with sharp streaks behind*

Brian Brake: Photoresearchers, Inc.



Leaf *When you take a close up of a raindrop, you can glimpse minute detail beneath the water, which acts as a miniature magnifying glass*

Red umbrella *Careful framing enhances the solitary mood of this passer-by The bright umbrella provides the only accent of colour in an otherwise grey picture*

Alternatives to tripods

Camera shake can spoil pictures taken under a wide range of situations. A simple camera support helps solve the problem, while being much less bulky than a tripod

Kim Sayer

[illegible]

Clamps

[illegible]

Camera supports *(clockwise from top) bean bag, tripod, suction clamp, clamp chest stock, screw, spike clamps and shoulder stock* **Clamp** *Make sure you attach your clamp to a firm object before you begin to shoot*

Over half the shutter speed range on [illegible] cannot be used if you limit your photography to taking only unsupported hand-held shots. Low light [illegible] wide apertures and high [illegible] slow shutter speeds are all for long [illegible] and unless you use some [illegible] support, you may have to forego many potentially interesting photo opportunities.

Unfortunately, most tripods are too heavy, bulky and cumbersome to be carried around in every photographic situation. Many photographers have a [illegible] interesting [illegible] for [illegible] and [illegible] possible to overbalance [illegible] with long lenses, which is when they are needed most. But there are alternative supports available which [illegible] to minimize the problems of [illegible] the camera steady while being [illegible] small and portable.

[illegible] supports hold the camera [illegible] like a tripod, while [illegible] only as a steadying device while the camera is hand-held. Most are [illegible] to be compact and lightweight [illegible] only to use [illegible].

Spikes

Shoulder stock *An example of the more sophisticated type of shoulder stock which gives a good degree of stability*

[illegible]

Pistol grips

[illegible]

systems are tripods or monopods.

Look at as many types of grips as you can before deciding what to buy. Some types combine any of several parts and mounting options. [illegible] and a button trigger to fire the shutter.

Shoulder stocks

[illegible]

Spike *A spike on a tube is useful for low-level work where you cannot easily set up a tripod* **Screw** *Based on the same principle as a spike, a screw can be fixed to a wooden support and allows you to shoot from a greater height*

Kim Sayer

K E Sayer

Multi-purpose supports

[illegible]

Specialist supports

[illegible]

[illegible]

Cheap alternative supports

[illegible]

Suction clamp *Ideal for attaching the camera to smooth surfaces which would give no purchase to a normal grip, this support must be securely attached*

[illegible]

Instant film

Instant picture photography is now very popular. But to most people, the processes of film development remain a mystery. In fact, the methods involved are based on straightforward photographic principles

At first sight, instant pictures seem to have little to do with normal photographic processes. The prints are ready in a matter of seconds, generally without the usual sort of negative. Some types of film even develop as you watch in daylight. In fact, instant picture films use a number of conventional photographic principles, though in a unique way.

Two types of film are used —peel apart and dry film (see page 802)—and both use normal silver halide emulsions. The colour processes use yellow, magenta and cyan dyes to form the final image, as with normal materials. And although the methods of arriving at a positive picture vary, all involve the forming of an initial negative image.

Dave King

Monochrome materials

The basic principle involved is that of *diffusion transfer reversal* (DTR), where image reversal occurs by transfer of the image from one surface to another. This principle can be clearly seen in black and white materials which are of the peel apart type.

A conventional light sensitive emulsion is coated on a film base, and it is this which is exposed in the camera. Opposite this is a receiving layer on a paper base which is not light sensitive. After exposure, the complete package containing these layers and the chemicals is pulled out between pinch rollers. This action bursts a *pod* containing a chemical known as a *reagent* and presses the layers together.

The reagent, which becomes spread between the two layers, is a very active developer which also contains a silver halide solvent such as *hypo*—sodium thiosulphate. The negative image on the film base develops very rapidly by normal chemical development. Simultaneously, the areas of silver halide which have not been exposed (representing the shadows) are dissolved by the hypo. This latter action forms a complex silver compound which diffuses into the receiving layer. This layer contains another chemical—usually silver sulphide —which causes the dissolved silver to deposit out, giving the positive image.

At the end of the processing time the two layers are peeled apart, and the negative part, which is of no further use, is thrown away. Only one type of film yields a reusable negative, which must be immersed in a sodium sulphite solution straight away, and then washed.

Colour materials

The peel apart colour films use a similar technique, with the usual additions needed for colour processes. The negative part contains the conventional tripack of emulsion layers sensitive to blue, green and red light respectively (see page 550). But each layer has, adjacent to it, an additional layer containing the appropriate image dye—yellow for the blue sensitive layer, magenta for green and cyan for red.

These dyes are not formed during development, as is usual with conventional colour processes, but are already complete. They form part of complex compounds called dye-developers, as they act as developing agents when the reagent is introduced into the print. This time the reagent is not a developer, but simply an alkali.

When a silver halide grain is exposed, it traps the dye-developer which develops it, and so the dye is 'anchored'. In areas which have not been exposed, the dye-developer is mobile and free to move up to the image receiving layer, where it is anchored to form the positive. Diffusion is slower than development so that, for instance, a mobile cyan dye-developer does not develop and so become trapped in the other layers as it travels through. These layers will have already been developed. To further slow down the diffusion, spacing layers are placed between the three colour layers.

If, for example, an area is exposed to red light, the dye-developer connected with the red sensitive layer (cyan) becomes trapped by the halide layer and cannot form part of the positive image.

Dye-developers from the other layers (yellow and magenta, are however free to move to the image receiving layer where they combine to give red

Dry pictures

The peel apart films need fairly accurate timing of the development process, and involve messy chemicals. More recent dry films avoid both these problems. The principles are similar, with a few additional complications.

With Polaroid types, the light travels through the image receiving (positive) layer which is transparent to reach the negative material. With most other instant films including the Kodak dry types the light enters from the opposite side. Therefore, in order to get a correct reading image, a mirror is used in the optical system of Polaroid dry film cameras

The integral reagent pod is burst by the motorized ejection through rollers after exposure. As usual, this spreads the reagent between positive and negative materials to initiate development and dye diffusion. It also contains titanium dioxide which forms a white layer beneath the image to show the coloured dyes by reflected light

Also in the reagent is a chemical which is initially opaque. In alkaline conditions at the beginning of development this chemical prevents light from reaching the negative layer. This means that development can take place in the light. As development proceeds the conditions change becoming more acidic and the reagent clears. By the time full development is complete (within two or three minutes) most of the alkaline chemicals are neutralized, and the permanence of the image is good

[illegible] similar through with [illegible] which make the two systems incompatible. The colour material requires that the image-forming light enters from the rear of the unit, opposite to the receiving layer. For image formation, the reagent and developer as in the peel apart types, but one which reacts with unexposed areas. This is a direct reversal type process version of the [illegible] process

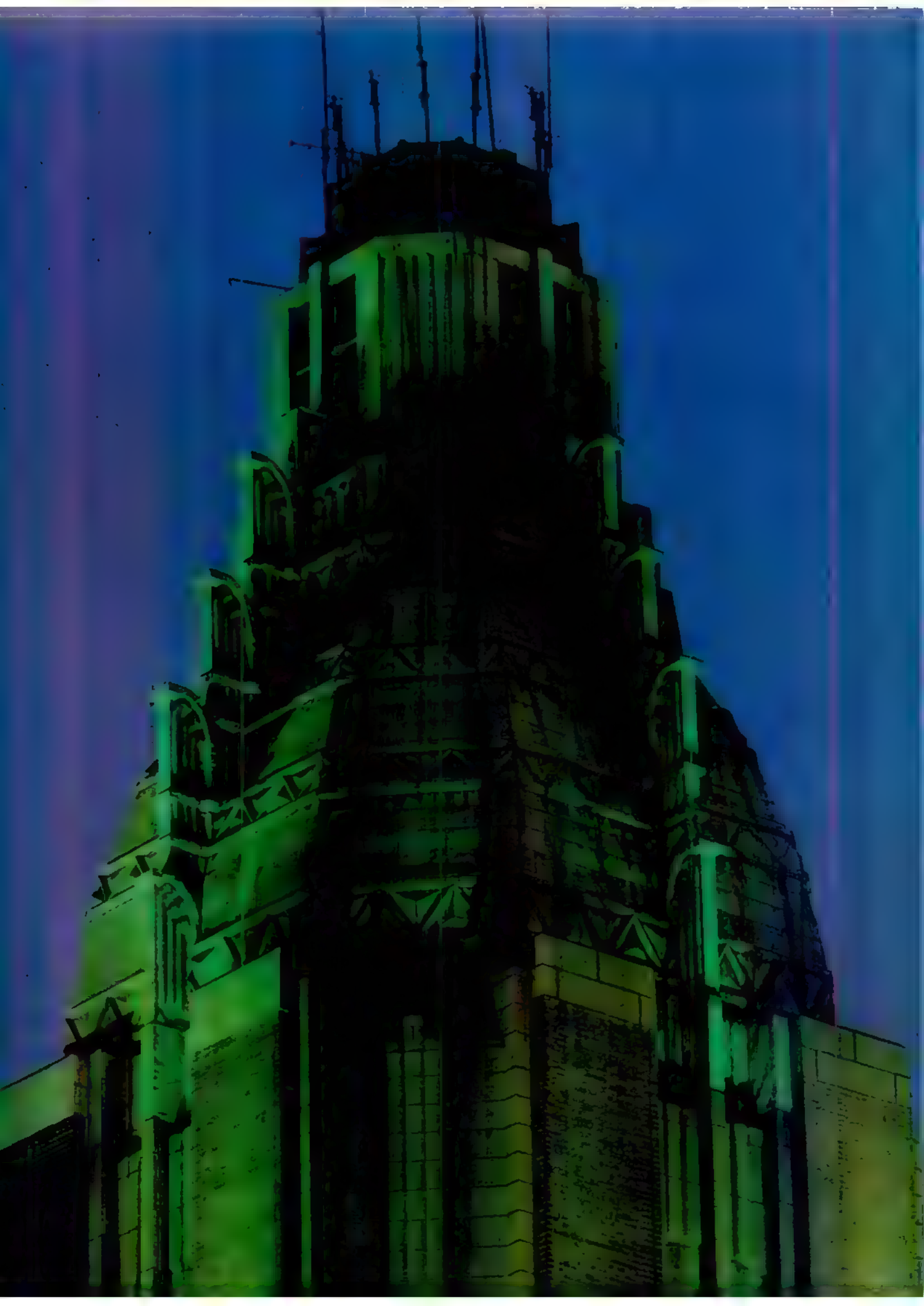
Instant pictures
The most popular sort of instant picture material is the dry film type. The image develops in daylight, and is protected from the light by a reagent layer, which is opaque. Coloured dyes move through the reagent to the layer above, and then combine to give the final image. If, for example, an area is exposed to red light, the final image is formed by the yellow and magenta dyes

Cross-section of Polaroid dry film

During exposure
(here to red light only)

After development

Paul Williams



World of photography

Reinhart Wolf

Architecture and food are not the most obvious subjects for creative photography. But one of Germany's top advertising photographers shows how skill in lighting and composition can make stunning shots

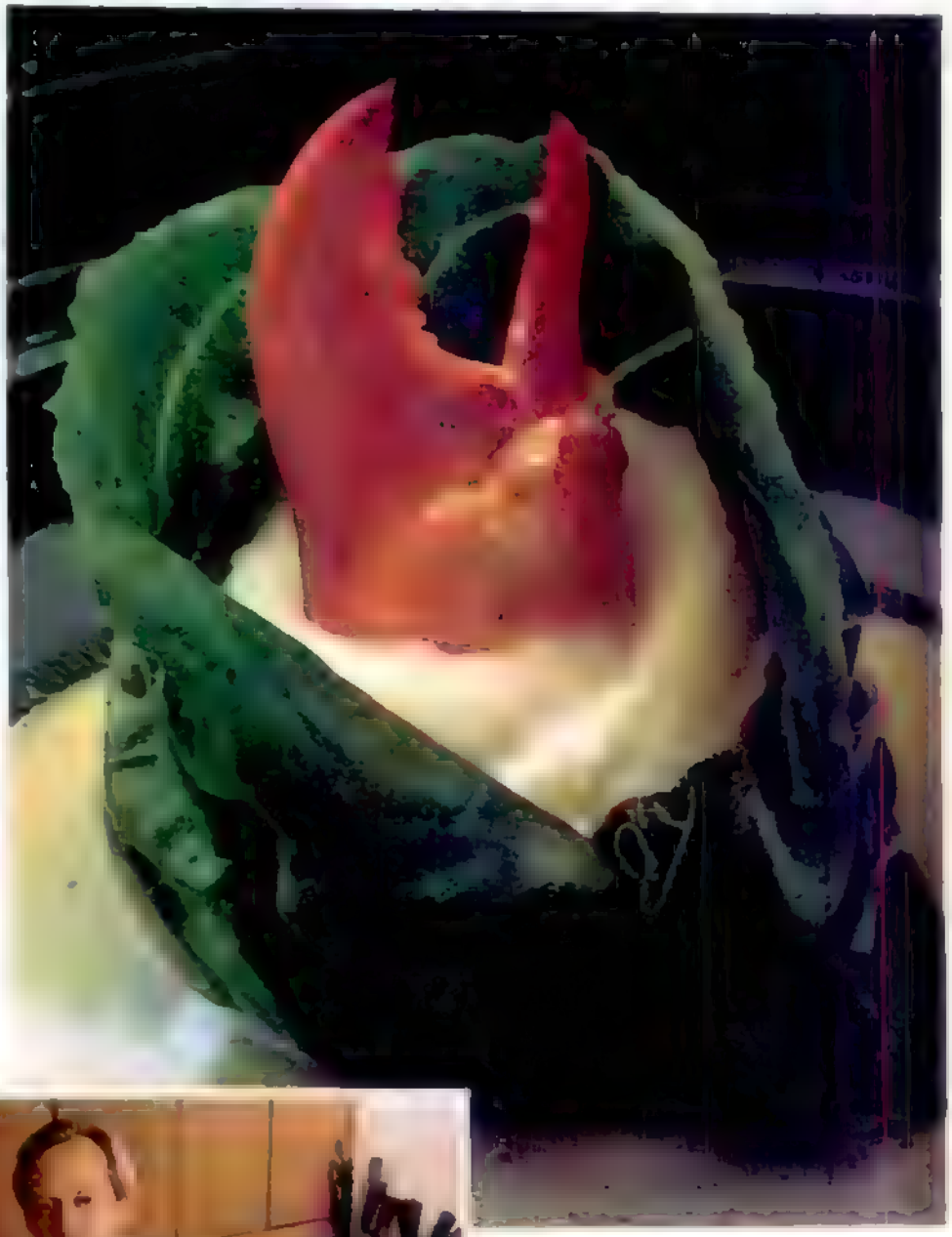
An acute sense of style and painstaking attention to detail are two major elements in Reinhart Wolf's approach to photography. These factors, together with a mastery of lighting, have made him one of Germany's top advertising photographers and given him a well-established reputation throughout the world.

However, Wolf's reputation is not only based on the quality of his advertising work. He is also renowned for his superb editorial work for such magazines as *GEO* and *Stern* and for the excellence of his architectural photography. His architectural photographs have appeared in many magazines and more recently in two books—*Faces of Buildings* published in Germany in 1979 and the superb *New York* on the skyscrapers of that city published in 1981.

Reinhart Wolf's base is a spacious penthouse studio in a modern building which stands in the heart of the old city of Hamburg with its quaint cobbled streets and Gothic architecture. Here he takes the majority of his commercial photographs and also runs the production company which he has set up to produce advertising films.

The studio is situated on the [illegible] floor. On one floor is the photographic studio [illegible] with an array of [illegible] and [illegible] fully equipped equipment, with an adjoining dressing room and kitchen. On the other is a luxurious sitting room carpeted with cowhides and furnished with custom-made seating made from aluminium [illegible]. This room Wolf's clients can use to relax on the studio [illegible] or [illegible] down to [illegible] the Japanese [illegible].

The [illegible] and [illegible] of the studio is Wolf's [illegible] [illegible] two [illegible] [illegible] the most important [illegible] of his [illegible]

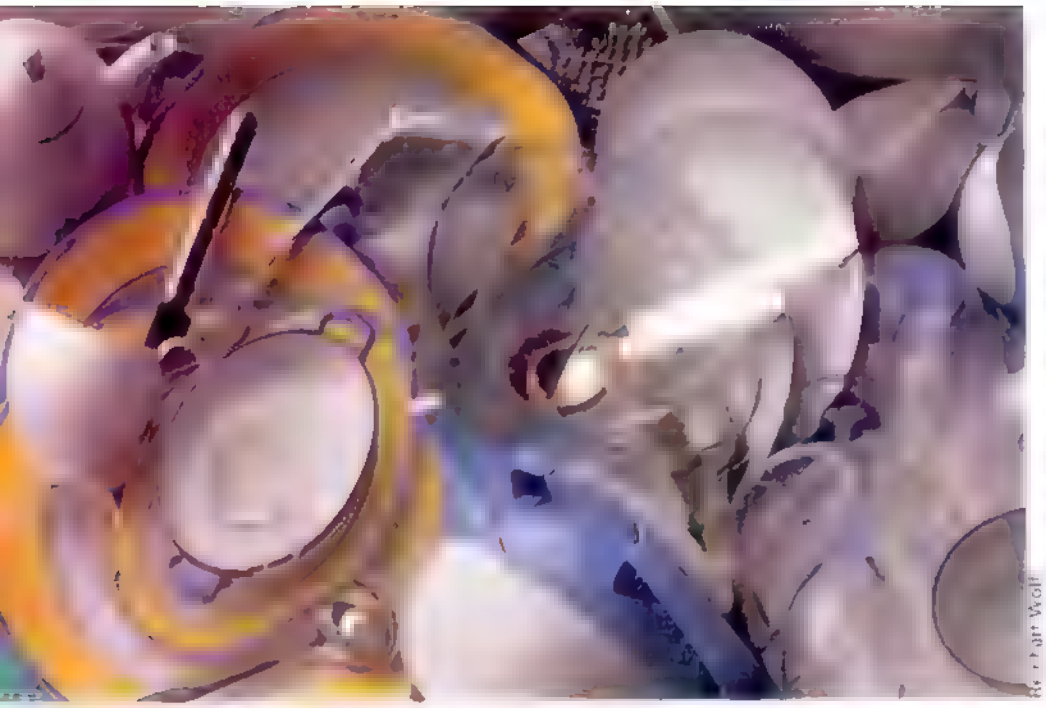


Reinhart Wolf

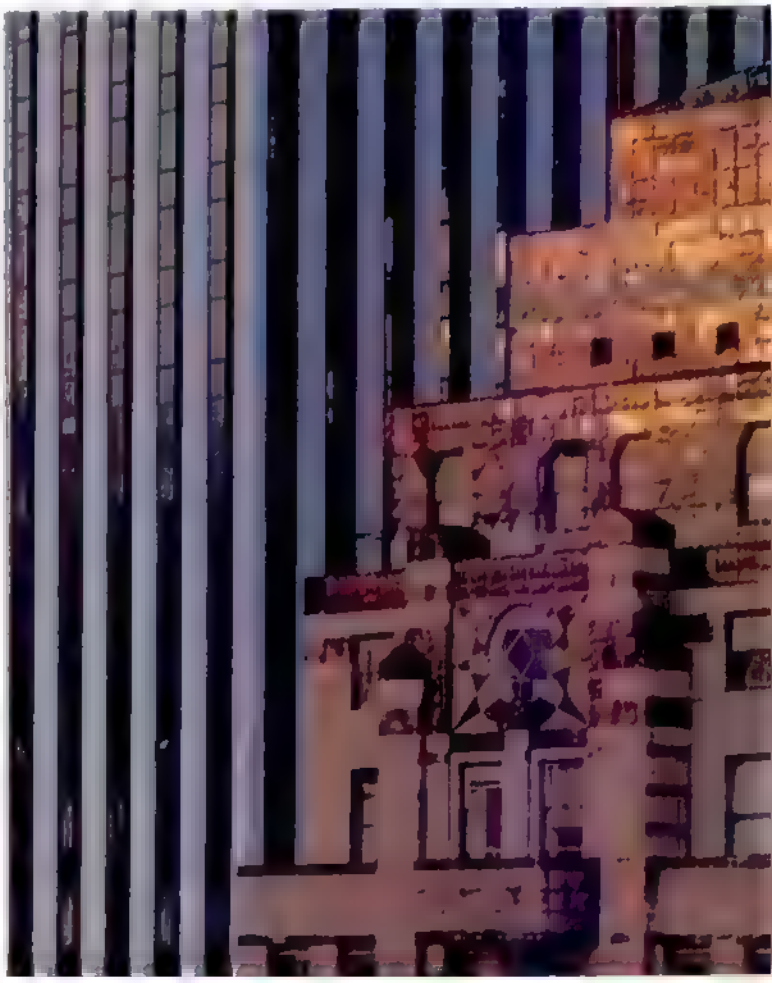
The Waldorf Astoria *(left) Taken for Wolf's book 'New York' and showing the intricate details of the hotel's tower*

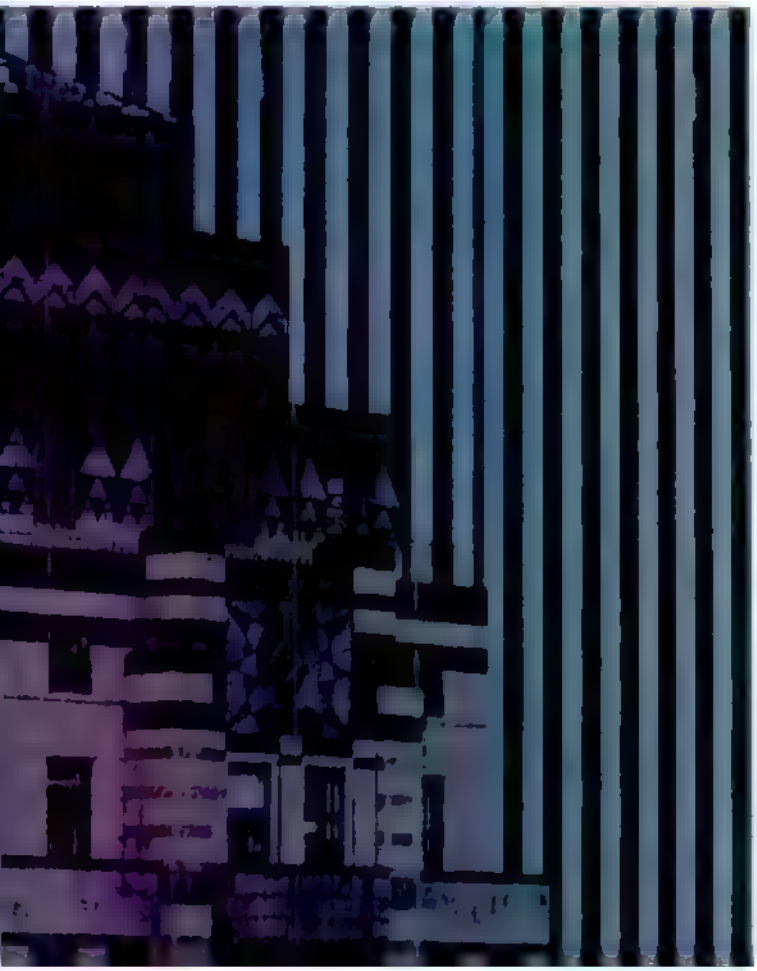
Culinary delight *(right) This seafood dish was photographed for a special item on gourmet restaurants for 'Stern'*

Reinhart Wolf *The photographer in his kitchen demonstrating a favourite hobby—the art of cooking*



Kitchenware *This picture was used over two pages in German Vogue to illustrate a variety of designer tableware*





General Electric Building (above) *Shot in the last few moments before dawn on a 10 × 8 camera so that every detail of its ornate tower was picked out by the weird half light*

Fuller Building 1928 9 *This is one of the most beautiful buildings in New York. Here it is displayed to perfection in the first few rays of the rising sun*

Herr Kaysen *Taken for a GEO assignment on the city of Bremen. This 90 year old man exercises by chopping wood for two hours every morning*

Some of Wolf's favourite shots are architectural photographs. His first book *Faces of Buildings* was a collection of this work, and one of his finest achievements is his book *New York*, a jewelry casket of the city's finest architecture. The photographs for this book were taken during visits to the city in [illegible] and [illegible] and were taken on the larger format (4 × 5 inch) Sinar camera often dubbed a 'cons a theire' [illegible]. His entire range of lenses were [illegible] and [illegible] and the pictures were taken on Kodak Ektacolor negative film and Ektachrome transparency film. The extraordinary pictures that resulted are accompanied by architectural notes on each building and an interview with Wolf by the artist Andy Warhol, in which Wolf explains his personal philosophy and describes the circumstances of the book's realization.

The book is a hymn to New York's skyscrapers and shows the buildings at their best. As Wolf says: 'I think these buildings are so crazy. They express so much of the art and spirit of America and of what took place there in the 1[illegible]s and 1930s. The people who made these buildings wanted the highest, the best and the most sophisticated. They employed hundreds of craftsmen which is impossible now [illegible]'

Wolf's pictures show the work of these craftsmen from vantage points that are inaccessible to most people. The Greers

Reinhart Wolf

The RCA Building, 1933 *Flanked by skyscrapers built nearly 40 years later, the RCA still outstrips them all*

Alberto Giacometti *One of a series of portraits of artists that Wolf took in the early 1950s in Paris*

Art you can eat *Taken for a series of articles in 'GEO' on the more elaborate forms of Japanese food*

put these kind of detail [illegible] up on their terraces where they [illegible] seen by the guys [illegible] down on the earth from the sky. I think that [illegible] the Americans put them [illegible] the architects showed [illegible] the buildings to their [illegible] these buildings [illegible] have said. Well, there are [illegible] that they [illegible] Gaudí. If we to something [illegible] It [illegible] look at them in the way they [illegible] from below, maybe they wouldn't have bothered.

As with his studio work, Reinhart Wolf's pictures of [illegible] show how important lighting is to his work. Many of the buildings were photographed in the very early morning or in the last rays of the setting sun. [illegible] the buildings [illegible] their own light. [illegible] them were [illegible] Yes, [illegible] each [illegible] what is the best [illegible] I would have to [illegible] trying to find the right light and the right point of view.

Dodging in colour

Few colour negatives or slides print 'straight' satisfactorily – many need correction to colour casts or shadow and highlight areas. For this, dodging techniques can be particularly useful

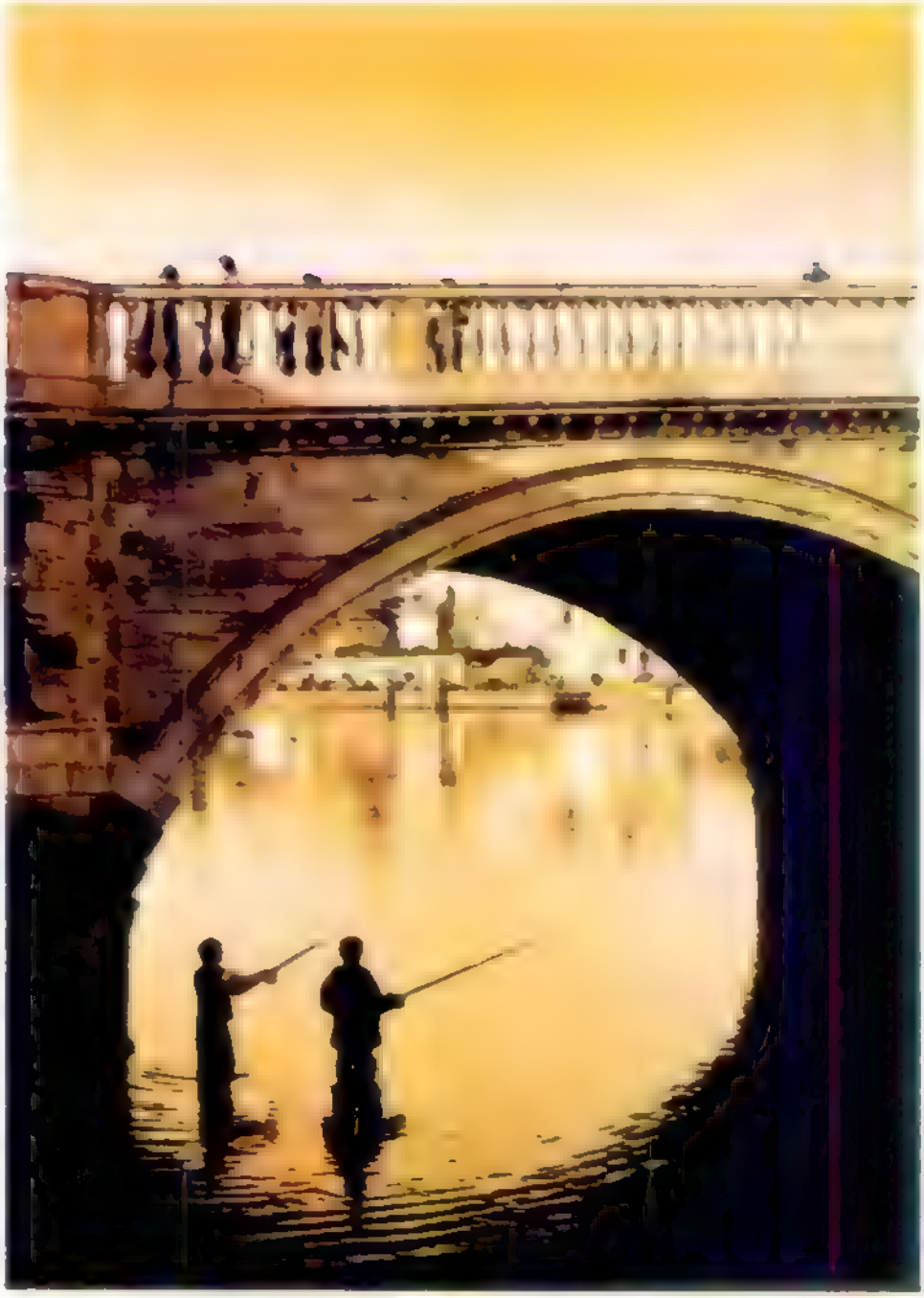
Dodging techniques

Dodging procedure

Local exposure control *A straight print (left) from a difficult negative can often be improved (right) simply by holding back exposure in parts of the image. Using a card mask with a cut-out the approximate shape of the shiny table and window area, it is possible to give an overall exposure suitable for this area but to hold back exposure elsewhere part way through*

Changing mood *A straight print of this impressive sunset showed a foreground which was light enough to distract the eye. By darkening this and lightening the sky a pleasant improvement has been made*

Dodging small areas



Local colour *This print was made from a black and white negative. The main exposure had colour filtering to give a suitable tone to the stonework. All filtering was then removed to produce an orange cast when the sky and water highlights were burnt in*

Local colour correction *A straight print (below) leaves an unsatisfactory cast in the shadow whites of the hotel. By using shaped pale green filters on a printing jig, the walls have been lightened and colour corrected (right)*

made through the dodging filters. Be sure to replace the glass before continuing with the exposure, otherwise refraction effects will cause a double image (what is called a ghost).

For small, but clearly defined areas, filters offered to prints were and not to sheet, and a [illegible] dodging tool are partially adequate.

These suggestions however apply to negative/positive colour printing. In reversal printing [illegible] however not only is it necessary to reduce exposure to darken an area and increase exposure to lighten it, but the filters required to eliminate unwanted casts are complementary to those needed when printing negatives. Filters of complementary hues to the cast you want to remove should be added to the exposing light beam. Thus a blue sky which is too yellow and too light in tone in a transparency is corrected with a blue filter instead of being darkened by increased exposure through yellow as would be necessary in printing a colour negative.

What you have learned now to carry out these basic techniques, you will find them to provide some thought-provoking pictures. You can, for instance, apply a filter over the lens, prevent a photograph to give it a completely unexpected colour such as green, yellow or red. Used in the right way, this technique can produce [illegible] effects. For example, a [illegible] with the sun just setting could be printed using filtration to give the sky a purplish colour while the exposure could be reduced for the rest of the frame, giving a [illegible] effect. Another technique is to make a [illegible] and to use a partial print [illegible] to give it a pale pastel [illegible] while the middle remains the normal colour.

Colouring black and white

[illegible] the process [illegible] further these techniques can be used to produce coloured prints on colour printing paper from black and white negatives. This is an extension of the procedure for making prints with an overall tint from black and white negatives [illegible] paper. If you repeatedly use any colour [illegible] paper, you must first make a positive black and white transparency from the negative and the same general procedure applies.

[illegible] used to add a hint of colour to a [illegible] or to create a striking area of colour in an otherwise monochromatic print. [illegible] than others to colour. Heavily the areas to be coloured should have smooth straight edges, so that you do not need to make [illegible] masks. The perfect exposure would be a [illegible] for example where the sky is to be coloured [illegible].

The first step is to produce the most expressive black and white negative for a normal print, as described on page [illegible]. If you have printed [illegible] in this way, you may be able to dispense with the step.

The next stage involves deciding which areas are to be printed in which colours. Calculate the exposure required for each part of the print using the filter factors [illegible].

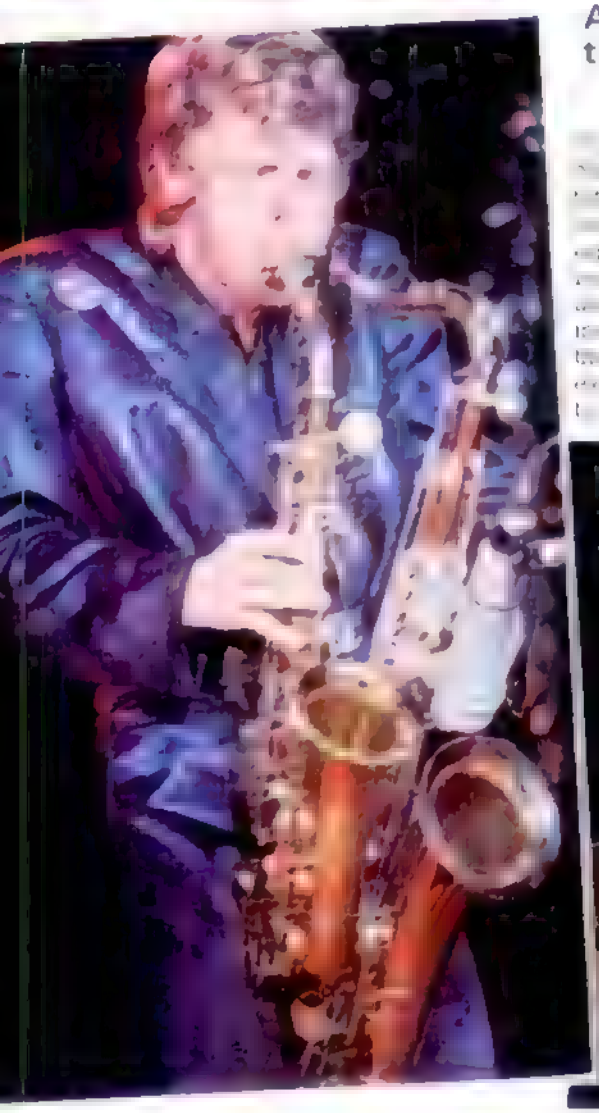
It is best to work on one colour at a time. Your choice of [illegible] should be very accurate. It is possible to [illegible] an extra [illegible] reduce [illegible] the other extreme you may find it necessary to hold a sheet of [illegible] over the paper [illegible] to shield areas of the print from [illegible]. You can then put your filter or mask in place prior to removing the card and starting the exposure. Alternatively, you can use a jig or a special mask produced from [illegible] on film.

John Ward. Photocolor II print materials courtesy Photo Technology Ltd

Assignment

ROCK CONCERT

Anyone keen on rock music wants to take pictures of their favourite stars. But what is the best way to take pictures in the often chaotic conditions at a gig?



Theatre of Hate *Laurie used his f 1 4 standard lens for the backlit shot of the supporting group* **Ian Dury** *A 200 mm shot at 1 60 second with the lens at its full aperture of f 4*

Sax player *(far left) By filling the frame with the 200 mm, Laurie's TTL meter gave a 'spot' reading which formed the basis for other exposures.* **Changing colours** *These three shots show how the lighting can change in seconds All were taken with the 105 mm lens, f 2 5, at 1 60 sec* **Close-up** *Laurie used the 200 mm lens at 1 60 for this moody view By propping the camera against a pillar, he could use 1 8 sec*

Photographing birds

To take good pictures of birds, you need to combine two skills—those of a photographer, who is able to adapt to varied and challenging conditions, and those of a hunter, able to lie in wait, or silently pursue the quarry

Birds are the only form of wildlife that most of us notice regularly—even for a city dweller hardly a day goes by without seeing a bird or hearing its song. It is hardly surprising, then, that so many people choose birds as subjects for their first attempt at wildlife photography. Getting a picture is often only a matter of leaving food out in the garden and waiting for the subject to swoop down. But if you are prepared to look further afield, it is easy to photograph many of the most common species in their natural, rural habitat.

The single most important factor affecting the quality of your pictures of birds is your knowledge of the birds themselves. If you know where you are most likely to find a particular species, your chances of coming back with a good picture are that much greater than if you are totally ignorant of birds' habits.

Learning about birds has another purpose. As cities grow and woodland is uprooted for farmland, there are fewer suitable habitats for many species of birds. If you have learnt something about the creatures you want to photograph, you will soon learn how best to go about it without disturbing their nests or their young. Some birds are relatively tame and will tolerate attention from a photographer, but other species must be approached with [illegible] to avoid disturbing them. In many parts of the world birds of all species are protected, and you can be [illegible] for intimidating them. Even if this is not the case, the bird should come first, not the photograph.

Equipment and materials

The photographic equipment that you need to get effective pictures of birds varies according to the species that you are photographing and how close you can get to it. For shy birds, for [illegible] however, will be inadequate for [illegible] shyest birds unless you [illegible]

Gulls in flight *Not all birds are naturally timid—many will come quite close to the photographer*

Blackbird *A fall of snow makes birds*

Thinly disguised hide *[illegible] a*

how you approach the problem of getting pictures of a bird in its natural surroundings. Broadly speaking, there are three quite distinct ways of getting pictures: stalk the bird, 'wait and see' —where the photographer lies in wait [illegible] until the bird appears—and then take photographs.

Stalking birds

For stalking birds you should use the longest lens possible, because the farther you are from a bird the less likely it is to see you and fly off. Always wear inconspicuous clothing so that you blend in with the surrounding scenery. If you are going to be stalking on the mud flats of a river estuary, then a grey outfit makes good sense, but brown, the traditional green of army camouflage in the trees is also good for woodland.

When you reach the general area where you plan to take pictures, first use binoculars to establish exactly

Car and beanbag *Even a car can be used as a hide, with the camera rested on a beanbag over an open window*

Gordon Langsbury/Bruce Coleman Ltd

Sooty terns *You do not need to fill the frame with a bird to make a good picture. Look out for atmospheric scene-setting shots like this*

[illegible] Bruce Coleman Ltd

where the birds gather. Then approach as slowly as possible, moving forward when the bird is preening, or feeding. Birds stay [illegible] when they are [illegible], so this is the best moment to move forward or to release the shutter. If the bird stops feeding and looks up, freeze immediately, in the position of movement you happen to be in. As soon as it starts to feed once more you can safely continue your advance.

Birds are much more sensitive to movement than they are to noise, and the sound of a camera shutter is often drowned by the [illegible] of the [illegible] that a flock of birds [illegible]. But even a slight movement is enough to scare a bird that is [illegible] distance. When you [illegible] a bird watching at the edge of your field of view, resist the temptation to turn [illegible] your head or your camera round to look at the bird. Wait until the other birds in the area settle down again, and then slowly turn your camera round to photograph the new bird, if possible, before the nervy bird in sight has flown off.

Wait and see

Putting out bait to attract a bird is the opposite approach to stalking. Instead of going to the bird, you wait for it to come to you. Although this may seem easier than stalking, it actually requires more organization on the part of the photographer. It [illegible] and [illegible] the bait, the photographer must not be conspicuous, and this generally means using some sort of hide and keeping out of sight.

A simple one-person hide usually consists of a small upright frame about

Bernard Robertson Jones

Home-made hide *As long as the photographer is concealed, almost anything will do as a hide*
Soaring puffin *A cliff top can provide a useful vantage point from which to photograph all kinds of sea birds*

On the nest

Yann Visage Jr 308

Creeping close

Blue heron

Fireworks

Fireworks are a traditional way of celebrating special occasions, but can be particularly difficult subjects to shoot well

Fireworks always make an attractive subject for the camera, whether they are the exclusive set piece pattern for large crowds at the main towns, or fireworks that you can set off in your own garden. Although it is sometimes possible to take interesting pictures by just pointing the camera and hoping for the best, you can get much better photographs by carefully planning your shots with a particular result in mind.

Firework pictures do not demand any special equipment. In some cases even a simple camera may give acceptable results. The main factors are the brightness of the display and your distance from the fireworks. If you are close to the front, the picture display is fairly slow standard or even wide-angle lens as used on compact cameras is adequate. On the other hand, at small private fireworks displays you may need to use a lens of longer focal length, in which case the 6, 7 or 8 x standard lens of a modern SLR is needed.

The other main requirement is to be able to fix the frame with the fireworks. This is hard to estimate before you see them in action, but it is probably better to err on the long focal length side. A bursting star shell explodes in a fairly small area of sky, then fades away. Our visual impression is that the shell filled the sky but in reality the comparatively compact explosion itself is by far the brightest and most spectacular part. So an 85–210 zoom may be the most suitable lens to use, despite its lower speed than a standard lens.

A tripod is very useful if you want to include buildings or people watching the display in the picture, but it is generally feasible to hand-hold the camera. If you do not have a tripod you may be able to steady the camera on a wall, or a fence, and fire the shutter using a cable release.

You can use virtually any film, but the result will vary with the type of firework and the sort of exposure you make. A slow film gives brilliant saturated colours and dramatic contrasts. A fast film allows you to take general scenes with the crowd and surroundings illuminated by the glare of the fireworks, and to use short exposures so that moving fireworks are frozen. But the most spectacular effects are often time exposures of starbursts, which could be over-exposed on a fast film.

Both negative and transparency films may be used, but transparency films can be more controlled. Even an experienced photographer can end up with only a few printable shots in a roll of film. Because there is a large element of chance involved in firework photography. With transparencies you can instantly see which are the best pictures and print only those, or mount them, but it is much more difficult to pick out the winners in a batch of negatives.

Despite the fact that the colour temperature of fireworks is very low, you do not need to use tungsten balanced film. Because there is a large element of chance involved in firework photography. With transparencies you can instantly see which are the best pictures and print only those, or mount them, but it is much more difficult to pick out the winners in a batch of negatives.

H A Roberts Tony Stone Associates

Fountain of colour *Multiple exposures and coloured filters were combined to produce this effective picture*

One important feature of fireworks is that the central areas are brilliant but there are fainter surrounding sparks. This means that certainly any exposure will record something but that at either extreme the results may be disappointing. If the exposure is too little for the film, you will see only a few coloured specks; if the exposure is too great the result will be a washed-out blur.

Tested to these effects, the general brightness of fireworks does vary. Public displays tend to be very bright with each burst illuminating the sky and casting strong shadows. Home fireworks, on the other hand, are often much paler and cover a smaller area.

Public displays

Fireworks at public displays take the form of either 'formal' displays or air bursts. Framed displays are in some respects the easier to photograph because they are generally quite static and there is no problem in composing the picture. Air bursts, on the other hand, are often more spectacular and well worth the extra care needed to capture them on film.

If you are photographing a framed ground display, you can take one of two approaches. One method is to use a small aperture and a long exposure to produce a subtle effect; the other involves a much shorter shutter [illegible]

[illegible] Those [illegible] different aspects of the display [illegible] colour and neither [illegible] better than the other. The choice of the most appropriate setting will depend on the particular display you are photographing and on the [illegible] the degree of natural light and whether or not you are going to [illegible]

If you do not want to be restricted by a tripod, you can [illegible] for an exposure of 1/15 sec or longer. In this case, you must use the [illegible] and the [illegible] and find [illegible] that the [illegible] [illegible] to [illegible]

Try to arrive at the venue before it gets either completely dark or crowded with people, so that you can find a good position which allows you to fill the frame with the structure that supports the display. As each piece is [illegible] try and take an exposure under [illegible] in mind and your camera [illegible] to the [illegible]

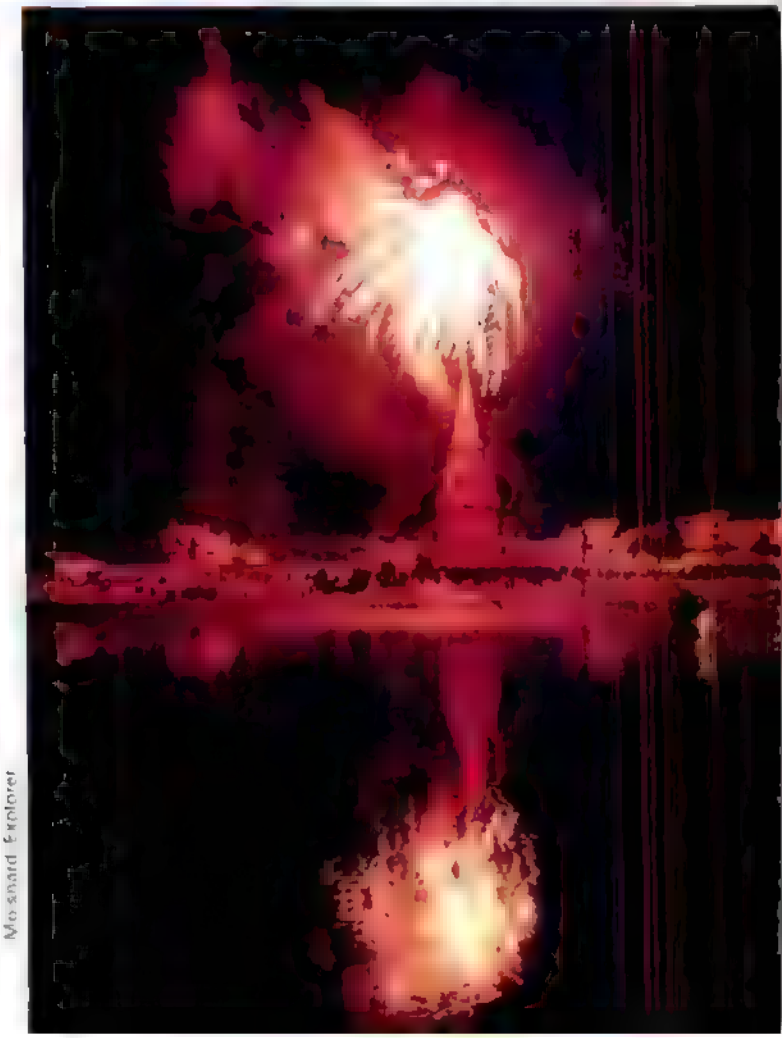
If the display does not fill the frame, your camera is likely to underexpose the bright areas to compensate for the dark areas around. So the aim [illegible] is to bracket your exposures by one stop both under and over, and by more if you can. Taking six frames at different exposures [illegible]

Jean Pierre Gerard Intragram

Air burst *In the course of a long exposure, the falling sparks leave brightly coloured trails in the sky*

George Wright

Whirling sparkler *For this kind of picture, you really need to use a tripod, or the rings of light will not be exactly overlaid. Bend the sparkler about six cm up the handle to make it easier to spin in perfect circles, and use a flash on the camera to fill in detail*



Mossnard Explorer

Fireworks reflected *Seaside displays can be particularly attractive, because the bright lights of the exploding fireworks can be reflected in broad expanses of water*

If the fireworks are distant or dim the TTL meter on your camera may not be able to cope with the low light level. In this case, you must resort to guesswork. With a film of say 100 ASA start with an exposure of 1/60 sec at f/4.8 and then bracket your pictures as widely as you can. A sensible series of settings would be 1/60 sec at f/1.4, f/2, f/2.8, f/4 and f/5.6 for an 'average' display.

If you have a shutter priority automatic camera, set the shutter to 1/60 sec, then move the exposure compensation dial in order to bracket the exposures. Start at +2 (some cameras show this as +4) then move to +1 (or +2), zero, −½ (or −1) and finally −2 (or −4).

Aperture priority automatics are more difficult to use for bracketing under dim conditions, that unless you can use the camera on a tripod, it is better to set it to manual and control the exposure yourself rather than leaving it to the camera.

If you are using a lens with a small maximum aperture, you may have to use a longer exposure to compensate for the reduced amount of light reaching the surface of the film.

A tripod will take the guesswork out of exposure, because the longer exposure times that are possible will allow you to spread the light from the fireworks across a wider pattern. If you do this, you must be careful to avoid over-exposure. A long exposure at seven or eight minutes with a wide aperture will almost certainly burn out the image of a dim firework and leave a shapeless blur of white or yellow. You can avoid this by using a small aperture in conjunction with a long time exposure.

As before, take a meter reading and base your exposure on this. Many cameras, though, have meters that do not function at speeds slower than about 1/30 sec, so you must have the information which accompanies the light meter. Refer to the city, landmark and the meter's instructions paper first. If you want to use a two minute time exposure, for example, take the meter reading with the shutter set to 1/30 sec. You must then be prepared to allow for the reciprocity failure of the film, which means that you must open up the aperture by five stops to compensate for the change in shutter speed. For example, if the meter indicates an aperture of f/8, you must set the lens to f/2. Unfortunately, failure is worse towards the end of the exposure, so that you must open up the aperture still further, perhaps by two stops, setting it at f/1.4.

Using a tripod has the advantage that you can use other techniques in conjunction with the long exposure. For instance, if you want to photograph a firework display, it is best to wait until the exposure to spread the image of the fireworks across the frame. With a zoom lens you can zoom in or out during the exposure to produce a special effect. And if you have a motor drive, the photographer can produce a very different result.

If you want to record the spectators in the picture as well as the fireworks, you could try using a neutral density graduated filter over the lens so that the crowd at the bottom of the frame receives extra exposure and the fireworks themselves are not overexposed.

George Wright

Fiery figure *To produce this spectacular portrait, a black clad figure traced the outline with a sparkler, then moved out of shot before the flash was fired*

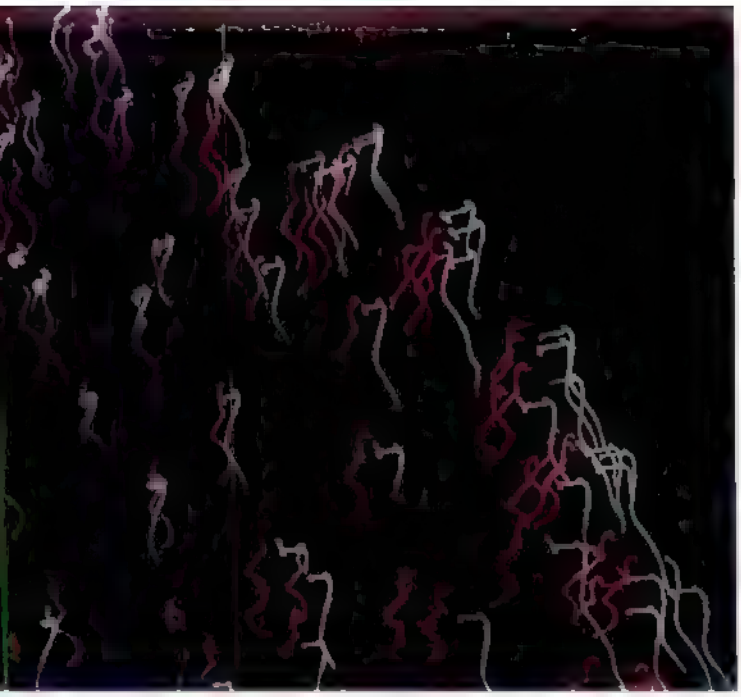
Pierre Tetre Explorer

Air bursts

Rockets that explode in the air produce some of the most spectacular firework pictures. Because their light is bright enough to illuminate the landscape around and they each last only a fraction of a second, they do not usually need a long exposure. If you want your pictures to show some of the features of the landscape, it is

Golden cascade *Small domestic displays can be quite effective if you include some of the spectators in the picture*

Home displays



Ball of fire *By using a double exposure and a small flashgun, you can produce some surprising multiple image effects*

Showers of sparks *Even with a simple auto exposure camera, you can take pictures like these—elaborate equipment is not needed. If you have manual override, set the lens to a small aperture such as f 8, and use a time exposure of several seconds*

Rangefinder cameras

The rangefinder is one of the simplest and most successful cameras ever designed. Versatile and capable of first class results, it is worth considering as an alternative to the SLR

The modern 35 mm SLR is one of the most versatile cameras ever developed and there are probably few photographic tasks it cannot accomplish. Before the mid 1960s when the SLR began to dominate the photographic scene a different type of camera had sway: the 35 mm rangefinder. And even today, there are still many photographers who prefer to use rangefinder cameras.

Strictly speaking, the term rangefinder should be applied to some of the modern fixed lens cameras that use a rangefinder focusing aid but these are being widely called compacts (see pages [illegible] to [illegible]). The basic principles of the rangefinder focusing system are discussed on pages [illegible] to [illegible]. This article covers rangefinders both old and new with interchangeable lenses.

Because rangefinder cameras have fewer moving parts than most SLRs, they are often quieter, smaller and lighter. They are therefore less conspicuous than SLRs and this makes them popular with certain types of photographic journalists and people interested in recording everyday life without distracting the attention of their subjects.

Some photographers find that the direct viewfinder system of a rangefinder helps them to achieve greater contact and intimacy with their subjects than SLRs. This can affect the style of their photography and the results can be seen in their pictures. For work in low light levels the best direct viewfinders of rangefinder cameras cannot be excelled since they are unaffected by the maximum aperture of the lens being used. They favour wide angle lenses with greater accuracy than middle and do not suffer from mirror blackout at the moment of exposure, something that can be particularly useful when taking pictures with flash. With an SLR it is possible to focus a picture and remain uncertain as to whether the flash has fired because your eye is pressed up against the viewfinder at the moment it happens to fire.

Some older rangefinder cameras are so sturdily built as to be nearly indestructible and are classics of camera design. Many people collect old models which, if well cared for, rarely fail and are rare and quite valuable and their value increases as time goes by. Even an old rangefinder camera is well worth buying just as ornaments. There are many camera repair companies who will prove the oldest rangefinder also to good working order. Very old rangefinders may be comparatively rare but they are likely to be around for many years.

Dave King. Equipment courtesy of Leica, Minolta & TOE

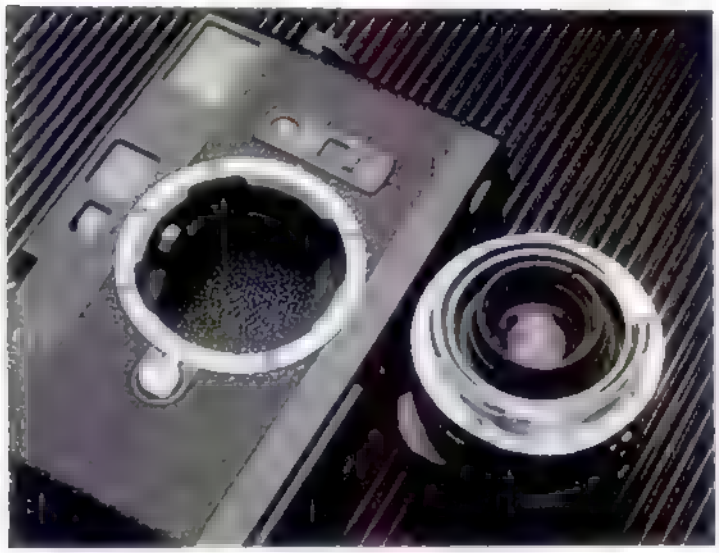
Rangefinder systems *Although the range of lenses available for use with rangefinder cameras is more limited than that for SLRs, it is still adequate for most purposes, and more compact than any 35 mm reflex system*

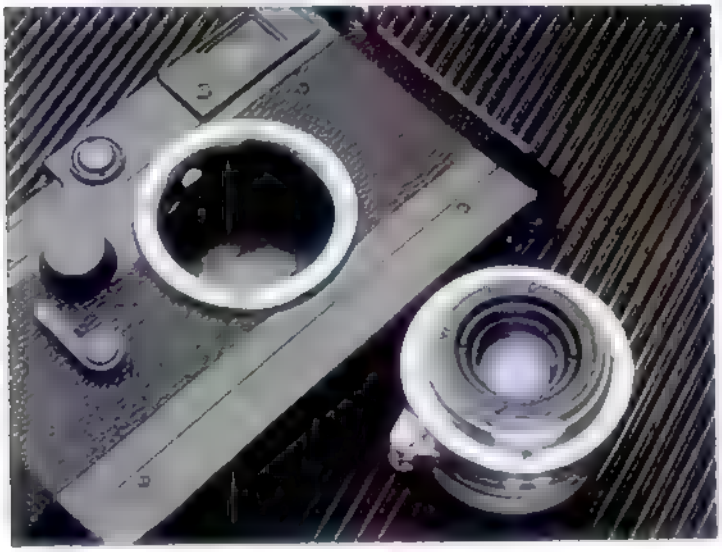
The choice available

Though there are fewer rangefinders available now than there were in the past you can still find a wide range of lenses, models either new or used at a reasonable price. The basic principle of operation is too good for the type to die out completely, and some outstanding cameras are still being made.

The most prestigious rangefinder is the world's [illegible] Leica. Leica was the first company to make 35 mm still photography popular and many features of Leica cameras originated with the Leica. [illegible] the Leica [illegible] the Leica [illegible] Leica [illegible] is a professional [illegible] and quality [illegible] [illegible]

French cafe *One of the most well known exponents of rangefinder cameras is Henri Cartier-Bresson, famous for his simple, true to life shots. It is in candid shots like this that the small, unobtrusive rangefinder camera comes into its own*





Henri Cartier-Bresson — Magnum

Old and new *Both cameras feature interchangeable lenses. The Minolta, shown top, has a bayonet mount, which allows lenses to be changed very quickly. The Canon, shown below, is an older, screw mount model*

Photos: Ray Moore

What to look for

Dave King

The Leica *This is perhaps the most famous of all rangefinder cameras. Based on a well-tried design, each successive model has been updated, maintaining high standards of precision. The Leica is part of a comprehensive system of lenses and accessories*

Early Canon *As the rangefinder is relatively simple in design, some cameras can last almost indefinitely, like this 20 year old Canon. A rangefinder in good condition can make an excellent secondhand buy*

[illegible] heaven by a professional camera repairer to work on Nikon models.

The range of lenses available for rangefinder cameras is not as wide as that for SLRs. The efficiency of rangefinders compared with SLR focusing systems decreases with longer focal lengths and it is impractical to use a rangefinder with lenses longer than 135 mm. No better illustration of this can be found than the fact that some manufacturers including Leica and Canon made special reflex housings for use with long lenses that effectively converted their rangefinders into SLRs. In practice, rangefinder lenses can be found in focal lengths ranging from about [illegible] to 135 mm, though very fast older lenses are [illegible]. An exception is the [illegible] mm lens made by Canon in the late [illegible], which was the fastest lens ever made for 35 mm cameras. Unfortunately, the image quality is not very good and the lens is more useful for soft focus effects than for normal picture-taking.

While you are examining the lens mounts of a camera you are contemplating buying, be sure to take a look at the shutter blinds that can be seen at the back of the lens when the lens is removed. The rangefinders without there is no SLR mirror system to prevent the [illegible] blinds if the camera is left [illegible] the lens without a lens cap. Most shutter blinds are made of [illegible] and with careless use [illegible] shutter blinds [illegible] Canon were [illegible] stainless steel and [illegible] marks are a sign of careless handling and such cameras should be avoided.

Viewing and focusing

It is the viewing and focusing system of a rangefinder camera that is its most important single feature. [illegible] approaches to viewfinder design have been used by different manufacturers over the years. The early screw thread Leicas had a roughly [illegible] viewing and focusing system. The subject is first focused through a rangefinder window, then the eye is moved to a separate viewfinder window to compose the picture. But most cameras have the rangefinder and viewfinder combined in a single window.

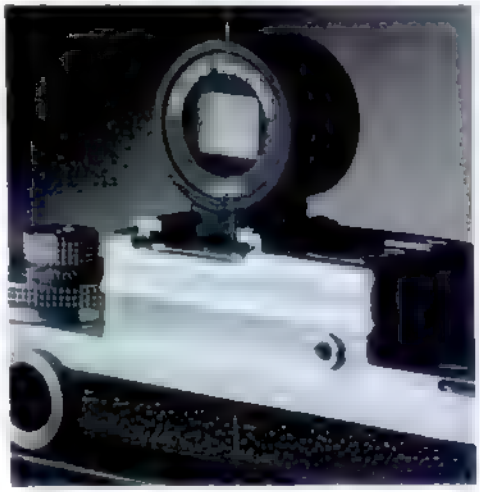
[illegible] Leicas, Canons and the Minolta SR-T SL have viewfinder optics that [illegible] the same lens as the taking lens, [illegible] than in use. As [illegible] the effective focal length of the rangefinder [illegible] and reduces the accuracy of the focusing [illegible] for the viewfinder to include a greater range of frame sizes for different focal length lenses and for the rangefinder spot to have sharp edges so that split image [illegible] subjects. By contrast, Nikon and Contaxes have viewfinders that [illegible] the subject [illegible] with a [illegible] rangefinder [illegible]. This means that photographers who prefer to view their subjects with their left eyes could [illegible] the viewfinder in front of their right eye [illegible] both eyes open see the viewfinder [illegible] their [illegible] view.

Some Canons had a special magnifying mechanism built into the viewfinder optical system that enabled the rangefinder spot to be seen very much enlarged. This increased the effective rangefinder baseline for greater accuracy.

A useful feature found on bayonet mount Leicas and the Minolta CLE is selectable frame lines in the viewfinder. The camera senses the focal length of the lens that is mounted with the help of a lug on the back of the lens and shows appropriate frame lines in the viewfinder. Leicas also have a frame line selector lever to enable the effects of different focal length lenses to be previewed so that you can decide which lens to use.

The current Leicas, the M4-2 and M4-P, can be fitted with a very quiet winder that can transport film at two frames per second. Fitting a motor to older models can be more difficult. Although Nikon virtually originated the modern battery powered motor drive, their old rangefinder cameras need to be modified slightly if a motor is to be fitted and the appropriate motor is in any case an exceptionally scarce collector's item. A spring powered motor for early screw thread mount Leicas was made, though once again this is now very much a collector's item. The special base mounted wind lever attachments that were made for Leicas and some other rangefinders are also rare items. These enabled the user to wind on the film with one hand and release the shutter with the other, thereby attaining framing rates comparable with motorized winders. Some Canons and Leicas were made with base winders built in.

The Leica M4-P automatically displays frame lines for 28, 35, 50, 75, 90 and 135 mm lenses, while the Minolta CLE shows lines for 28, 40 and 90 mm lenses. In both cameras the frame lines are automatically displaced slightly in the viewfinder to compensate for parallax errors when focusing on objects at different distances. In both the Minolta and the Leica the frame lines are illuminated by a separate window on the front of the camera. This system, though more complicated and expensive, gives brighter frame lines than [illegible]. That is not found on [illegible] expensive cameras.



Auxiliary finder *Cameras which do not show frame lines for different lenses require an extra finder as shown, when used with lenses other than standard*

One point about the rangefinder [illegible] at a distant object [illegible] means the rangefinder [illegible]

[illegible]

Do you want one ?

[illegible] for you

Oliver King

Minolta system *This compact outfit can be bought as a set. The components are all of very high quality*

Russian cameras *Though not made to the same high standards as some others, they are rugged and inexpensive*

Assignment

The flowers of Baden-Baden

A profusion of brilliant colours and delicate textures—flower festivals seem irresistibly photogenic. But they demand a selective eye

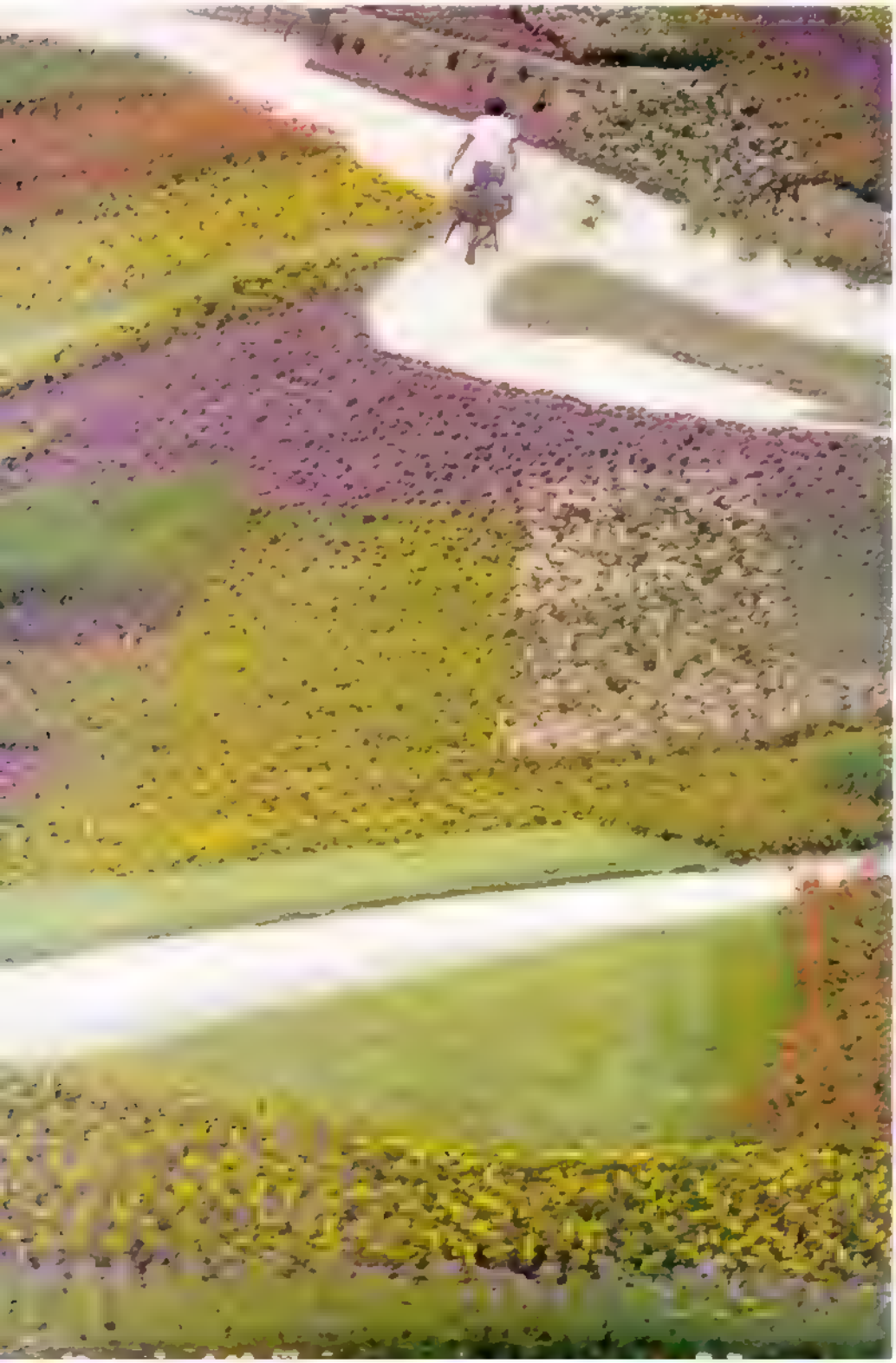
At an event like the Baden-Baden flower show it is easy to become overwhelmed by the sheer colour and spectacle and [illegible] everything in sight. As Sergio [illegible] it is important to [illegible]

The first step, therefore, is to obtain permission to photograph from the organisers of the event and, if it is a large event, get a programme so that you know exactly what is going on. Sergio arranged his day [illegible] to concentrate on indoor shots in the morning and [illegible] in the afternoon when he expected better light.

For the morning session in the gardening house there were a number of [illegible] problems because the light was [illegible]. For good colour, Sergio wanted to use a fairly slow, 64 ASA (ISO) film, but this meant long exposures. A tripod was

Flower field *A distant viewpoint and a telephoto lens help to flatten perspective and bring out the pattern of the flowerbeds, a figure in the middle distance completes the shot*

Couple on a bench *At popular events like this, candids are always worth looking for.* **White flowers** *For a simple, uncluttered image, Sergio concentrated on a single bouquet*



Sergio Dorantes

Wide angle
With a standard lens, this shot would have been dull, but a 16 mm lens creates a strong image
Watering time
The exhibitors can often make as good subjects as the exhibits
Brilliant blooms
Wide angle distortion helps to give an impression of the profusion of colour that pervades events like this

therefore essential.—some of the shots needed exposures of almost [illegible]

Another problem in the garden house was the mixture of daylight and artificial light sources. To avoid [illegible] film, constantly [illegible] balanced film and filters [illegible] where the light was [illegible]

Indoors, the [illegible] of the [illegible] and the [illegible] and the choice of [illegible] appropriate [illegible] Cameras at [illegible] flowers is that [illegible] genic so [illegible] [illegible] lenses [illegible] day when the light [illegible]

Aerial photography

Aerial photographs are now a vital part of surveys and planning for projects as varied as orange growing, archaeological studies, traffic flow investigations, wild life management and pollution surveillance

[illegible] in a war balloon in [illegible] H. Stanley took pictures of the ground below. The [illegible] taken from a balloon in the development of modern aerial photography, as far back as 1858 [illegible] the pioneer photographer in Chelsea, London, and he brought back the first aerial photographs of an [illegible] site.

The pictures were exhibited and published. Incredibly, [illegible] parts of the photographs [illegible] showed the entire [illegible] fortress and earthworks in precisely [illegible] that never [illegible] Aerial photography became a [illegible] of archaeological [illegible] their potential [illegible] rather than [illegible] for [illegible] objects.

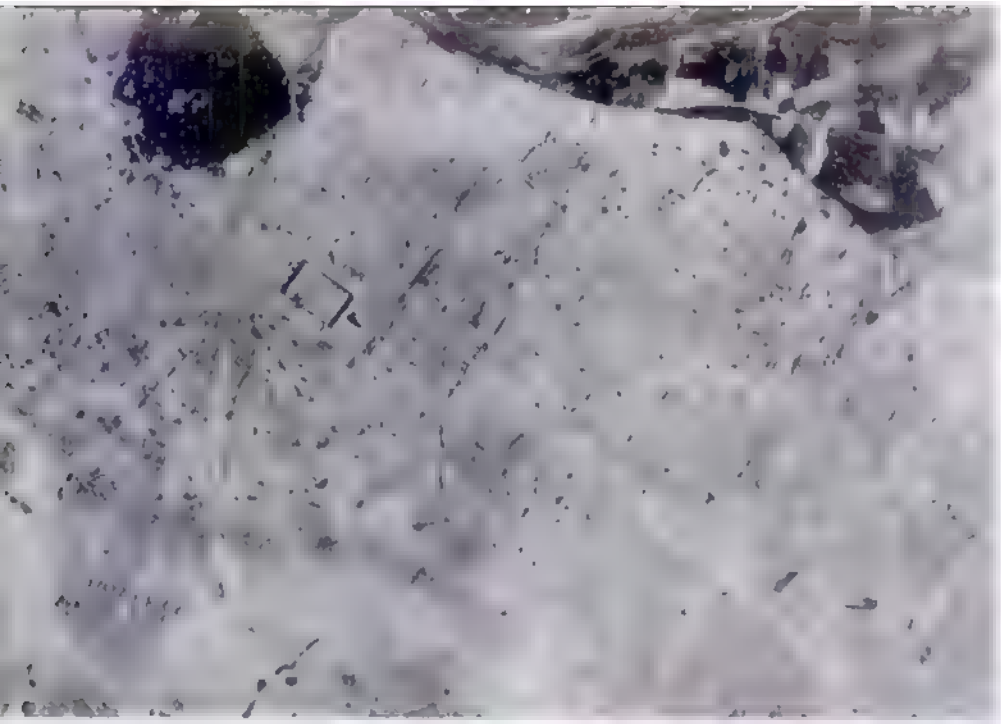
The near patterns shown up in aerial photographs are now a [illegible] part of investigations at levels as varied as [illegible] and economy. They have revolutionized the [illegible] industry and, as populations and living costs escalate, they become ever more important for management and planning of land and resources.

The history of flight and aerial photography go hand in hand. The first pictures from the air were taken of Paris in 1858 by the pioneer photographer Gaspard Félix Tournachon, who called himself Nadar. Nadar happened to be an enthusiastic balloonist as he was a photographer, so he combined the two interests. A version of this [illegible] for [illegible] photography to the highest [illegible] art.

Kites were used for aerial photography in the [illegible] of the 19th century and the [illegible] of earthquakes and fires in San Francisco in 1906 [illegible] the way. Pigeons and [illegible] were also investigated but it was powered flight that made photography a practical and reliable tool.

In 1914 roll film cameras were strapped to the sides of World War I aircraft so they could take pictures of enemy activity. Aircraft and crews tried desperately, to draw these spies in the skies and the photographic industry worked just as hard to improve its equipment. In Germany the predecessor of the modern vertical survey camera was developed. It was [illegible]

Land use *This view of San Francisco was taken from a height of 17 km, on Kodak Ektachrome infrared film*



Types of film

[illegible]

Ancient Samarra *Only a very small town (top left) remains on the site of a city once housing several million*

that took 25 four-inch (100 mm) square exposures on a 100-foot (30 m) roll of film. A propeller in the slipstream powered mechanisms to advance and cock the shutter.

The millions of air photographs taken in both world wars provided an information explosion for archaeologists. A pioneer was the Englishman Colonel Beazeley, who made several flights for the Royal Engineers in World War I over enemy territory on the Mesopotamian plain.

He noticed sharp outlines of canals and a rectangular layout of streets. Photographs revealed traces of an ancient city that ran for 4[illegible] km along the Tigris River which Beazeley estimated could have housed four million people. He had found the medieval city of Samarra. Built in the ninth century by Caliph Mu'tasim, the city had a lifespan of only 50 years and had lain under a light covering of sand ever since.

Since World War 2 the emphasis in military aerial surveys has been on surveillance from great heights. Details of the most powerful cameras and their uses are closely guarded military secrets but it is known that high-level reconnaissance planes can take pictures from over [illegible] metres, twice the height of Mount Everest. These are clear enough to show details such as parked cars.

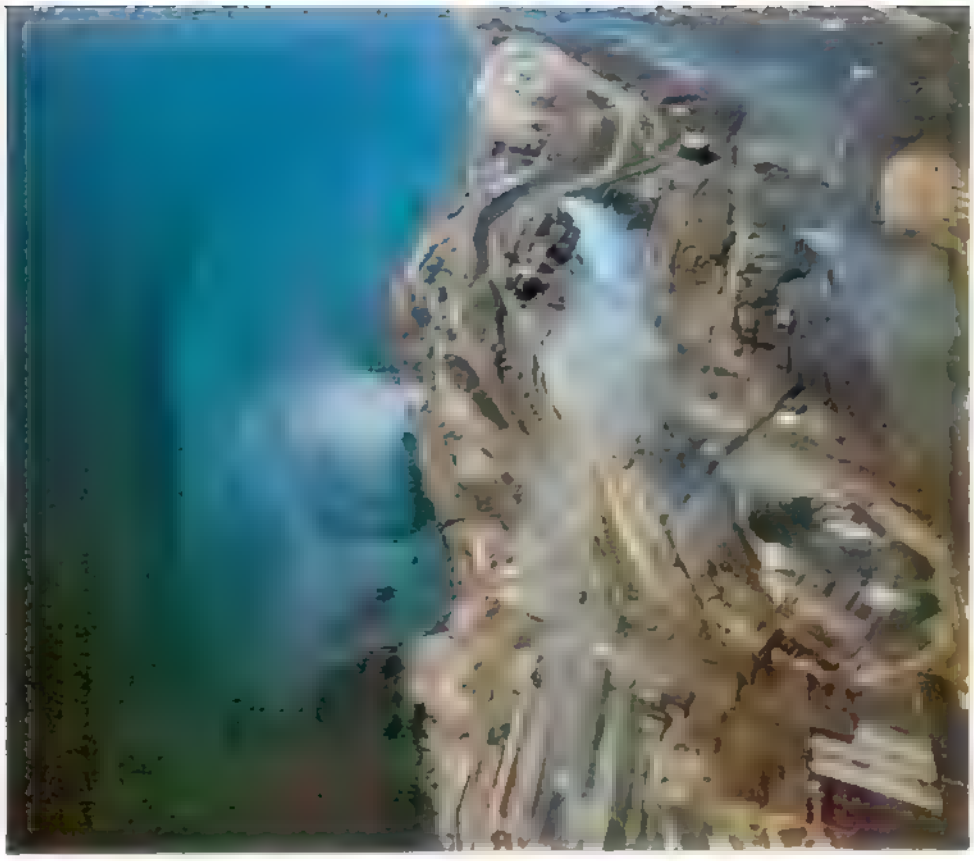
Satellite scan photography is now widely used for large-scale surveillance of land areas but the quality of pictures obtained is limited.

The US space programme led to the development of very specialized cameras designed to take pictures of the moon. The technique involved reduces the distortion of straight lines when the camera is pointed downward. One such camera, a 70 mm square Hasselblad, is used by the University of Cambridge, England, which has its own department of aerial photography.

Georg Gerster: The John Hillelson Agency

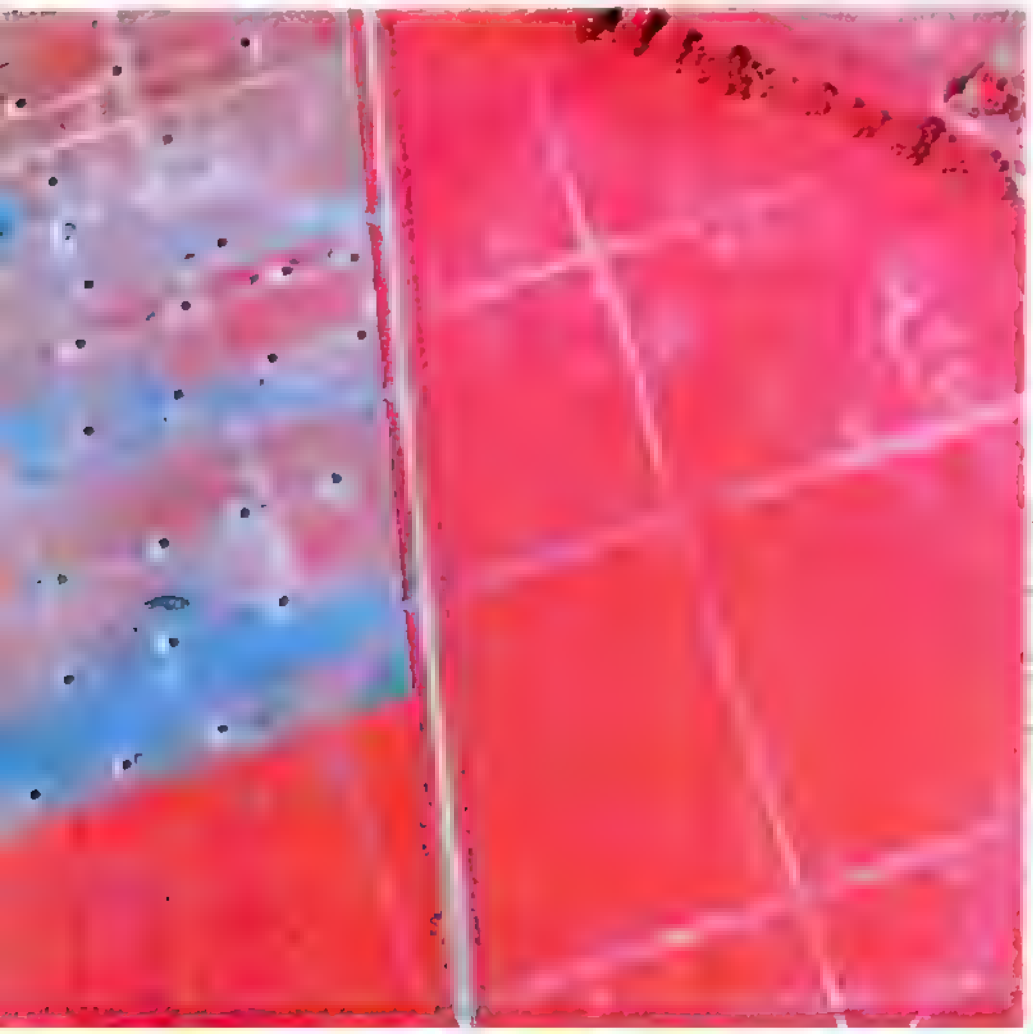
Anthropological record *These marsh dwellers' homes were revealed where the Tigris and Euphrates meet*

Map making



Pollution *Both air and water pollution show clearly on this view of a steelworks in the north-west of England*

False colour *A grid of ancient Roman roads at Silchester, England, shows through crops (red) and animal pens (blue)*



[illegible]

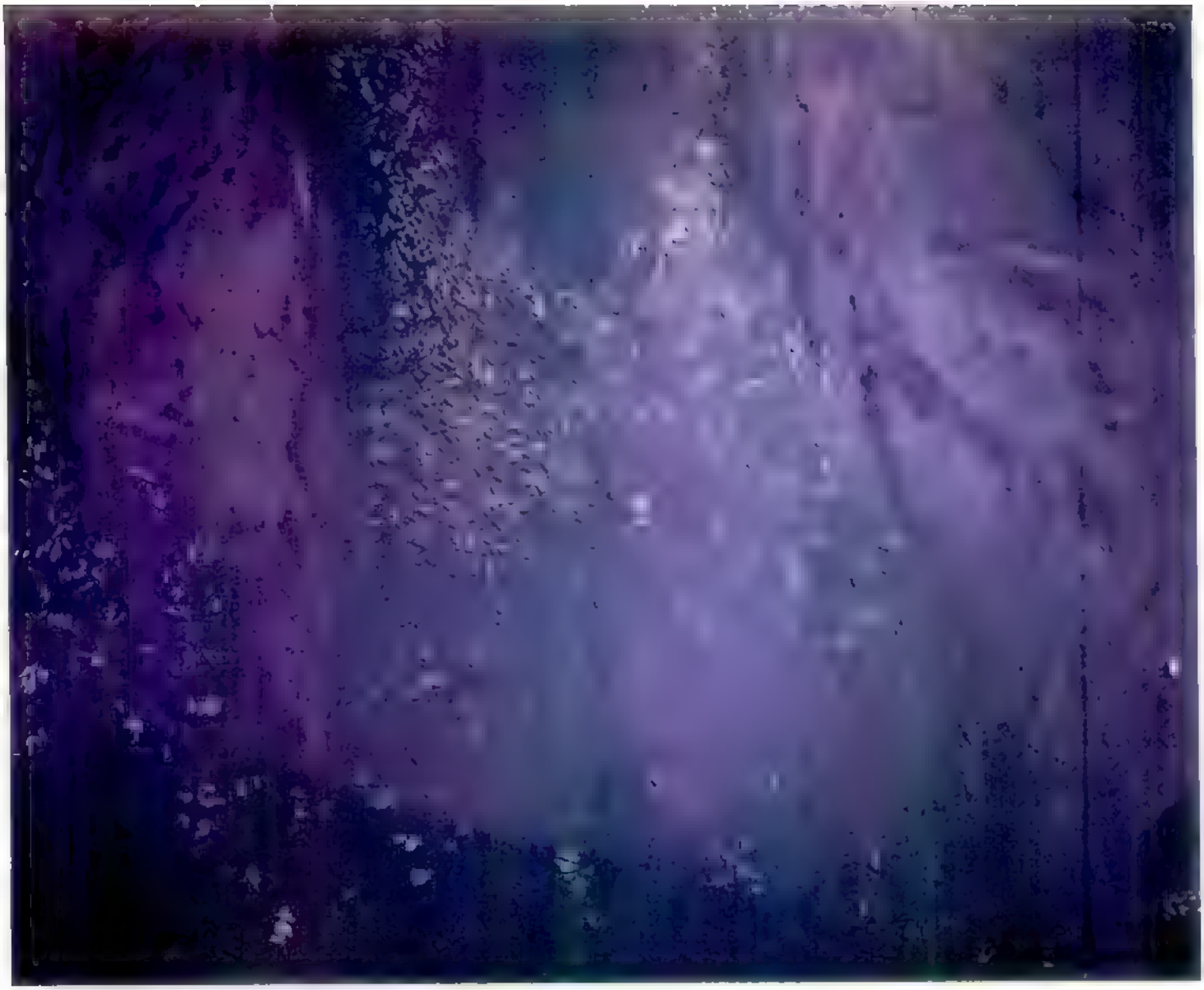
[illegible]

Looking at the land

[illegible]

Courtesy, W. T. Hewitt, ODF

Photo mapping *Special cameras are used to record precisely positioned vertical shots such as this one of central London*



J. Douglas Heyland

by providing a record of congestion and traffic flow at different times. For highway surveys, the basic task requires fitting proposed routes into natural terrain features in a way that will be most economical in construction.

Aerial photography is ideally suited also for evaluating topography, drainage, property values, soils, impeding vegetation, and special trouble spots such as where tunnels will be constructed.

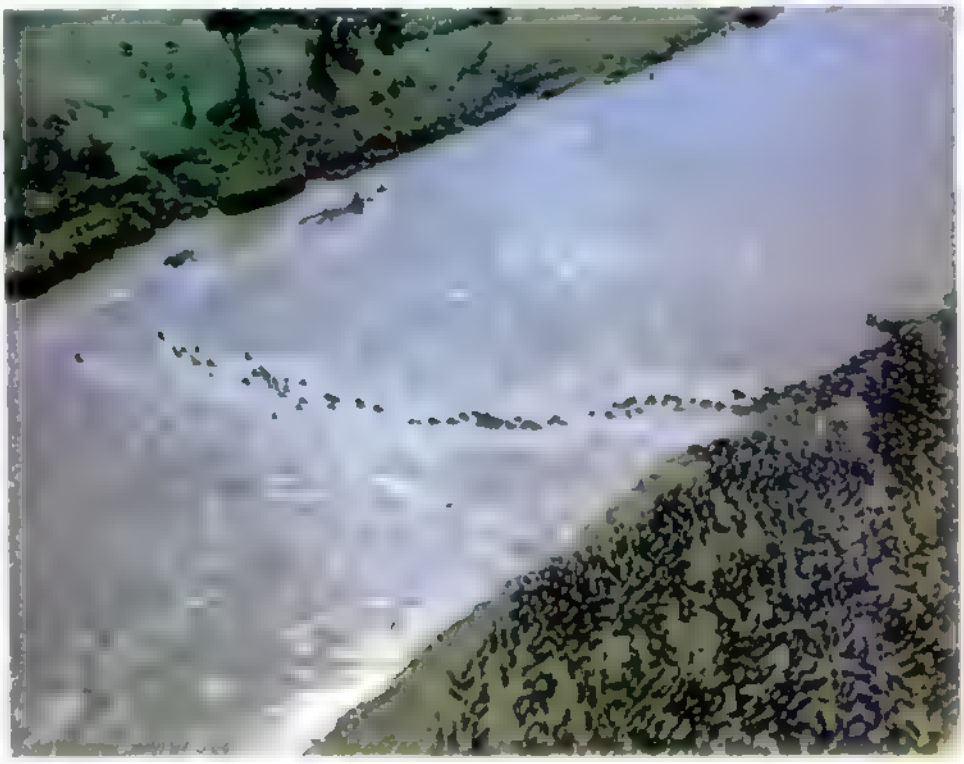
Photography of rapidly expanding urban areas repeated at periodic intervals can pay for itself many times over because of its value in discovering new taxable property. Such coverage has proved to be especially efficient for detecting new additions to residences or industrial plants, garages, swimming pools, new areas such as parking lots, and instant housing comprised of mobile homes or prefabricated cabins. Local authorities can use this information as a basis for revised rates assessments.

International boundaries are also sometimes fixed by politicians negotiating around the table using aerial photographs. The disputed areas are later inspected and fixed on the ground.

Resource surveys

For the geologist, air photography greatly helps regional surveys designed to assess geological structure or mineral

Photo census *This picture of the rarely seen beluga (or white) whales at their breeding grounds in Cunningham Inlet, Northwest Territories, Canada, was taken on a Wild RC-8 aerial camera using Kodak water penetration film*
Migrating wildebeest *Population counts by aerial survey are the most practical methods over vast areas of land*



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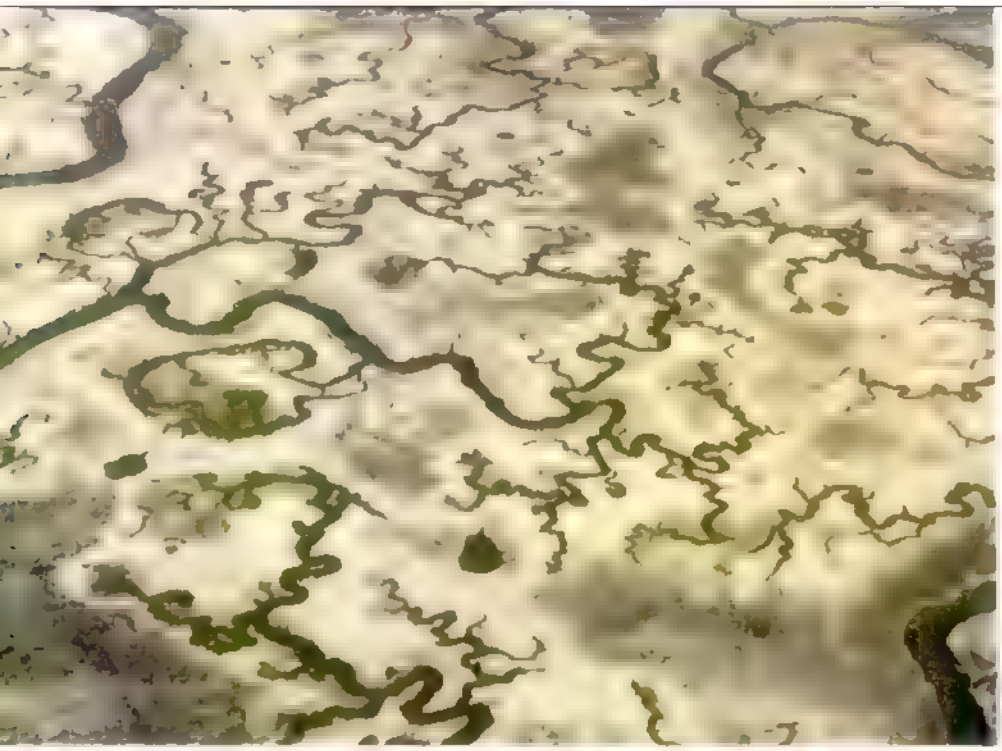


G R Roberts

Geological survey *A complex pattern of drainage in the San Francisco Bay. The white areas are salt deposits*

resources. Infrared aerial photographs have helped to map the oil fields of Alaska's North Slope and to locate mineral riches in the vast Australian interior. Now this photographic technique is being used to explore the geology of the earth's shorelines.

Gradual geological changes can also be recorded such as landslips, soil creep, the flooding of valleys, silting of estuaries, erosion of coasts and shifting of sand dunes.

By studying aerial photographs naturalists gain valuable information on such animal habits as the state of feeding grounds, the size of the herds and even on the work of poachers. By knowing how many wild animals exist in a certain territory and where they are, the authorities can establish hunting seasons and set bag limits which are regularly adjusted to fit the size of the herds.

Photographs at large scale also convey much information about the condition of animals and the composition of the herd by age and sex. Such population counts are aided by infrared film because animals often blend in with their surroundings.

Each year insects and diseases are responsible for the destruction of millions of cubic metres of standing timber. Aerial photography can help to speed up control measures or tree surgery performed by providing early detection of infected timber stands.

In previous years forests and orchards attacked by diseases or insects would generally remain unnoticed until ground crews or aerial observers could detect a visual change in the colour of leaves or tree life. Today, multispectral photographic coverage may record incipient attacks or potential danger spots several days or even weeks before they are seen by aerial observation with the naked eye. When foliage is attacked by insects or diseases, one of the first detectable changes that takes place in the leaves is a loss of infrared reflection which shows up on infrared film.

The forester can also estimate crops by species and spot the outbreak of fires in remote areas.

Aerial archaeology

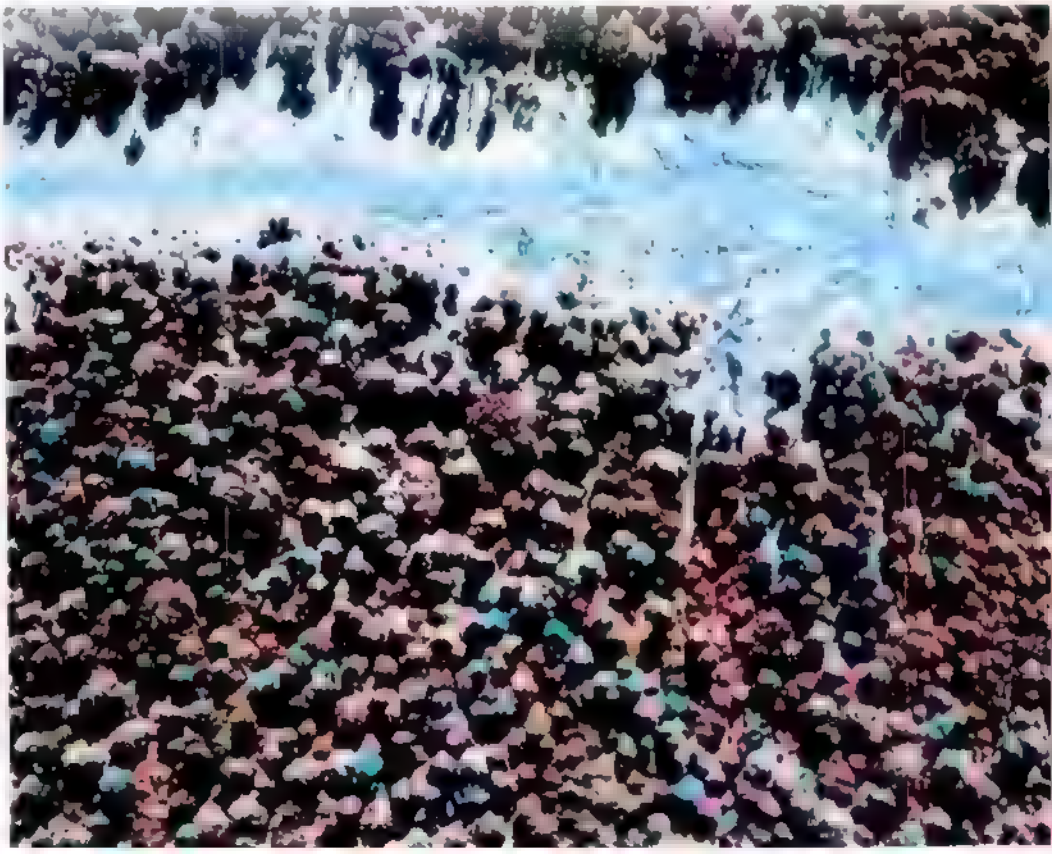
Besides making it easy to see and record recent changes in the face of the earth, aerial photography makes visible the past of mankind. An archaeologist can use aerial photographs to discern irregularities in the natural pattern of land in desert areas, especially under oblique morning or afternoon sun. In cultivated areas the irregularities show up more in the type of vegetation. [illegible] examined survey photos of the [illegible] for example, and found [illegible] in the area which had already been investigated on the ground. [illegible]

However, indications of foundations [illegible] better than surrounding [illegible] growth is stunted in [illegible] and variations in stem height and leaf colour create different shadow patterns. More luxuriant plant growth may show up from the air as slight differences in colour, indicating better nutrients in the soil below. Good drainage created by stone foundations and dressed stone walls sometimes has spectacular results. Poppies and daisies prefer well-drained soil and the stone foundations of ancient Roman forts are sometimes handsomely stamped out by red and white patterns of flowers in wild meadows. Similarly, snow barriers may cling to the face of a low rolled or mud layer over ancient excavations filled in with a different type of soil that warms up more quickly under the sun.

Some archaeological sites are only mental appearing only under the right weather conditions two or three times a century. One such site appeared near Yeavell in northeast England at the drought of 1976. Meadow grass grew along the outlines of a [illegible] of overlapping royal halls thought to be the palace of Edwin, the Anglo-Saxon king of Northumbria from [illegible].

More sophisticated equipment will continue to expand the wide and varied uses of aerial photography. In the last two decades the use of satellite imagery has proved an increasingly important part of [illegible] days when [illegible] over large areas taking photographs [illegible]

Forestry *Infrared film showing insect infested timber in Oregon, USA. The blue-green areas are damaged trees shown among healthy red or pink trees*



NASA Science Photo Library

Special print materials

Coloured bromide paper, and sensitized metal or cloth offer some interesting creative possibilities if you want to try different printing materials

Once you have perfected the art of conventional printmaking, you may wish that you could print on materials other than the conventional ones. In fact there are several special materials available from specialist suppliers which can add variety to your darkroom work. Processing is usually straightforward and the resulting prints often have textures unobtainable in any other way.

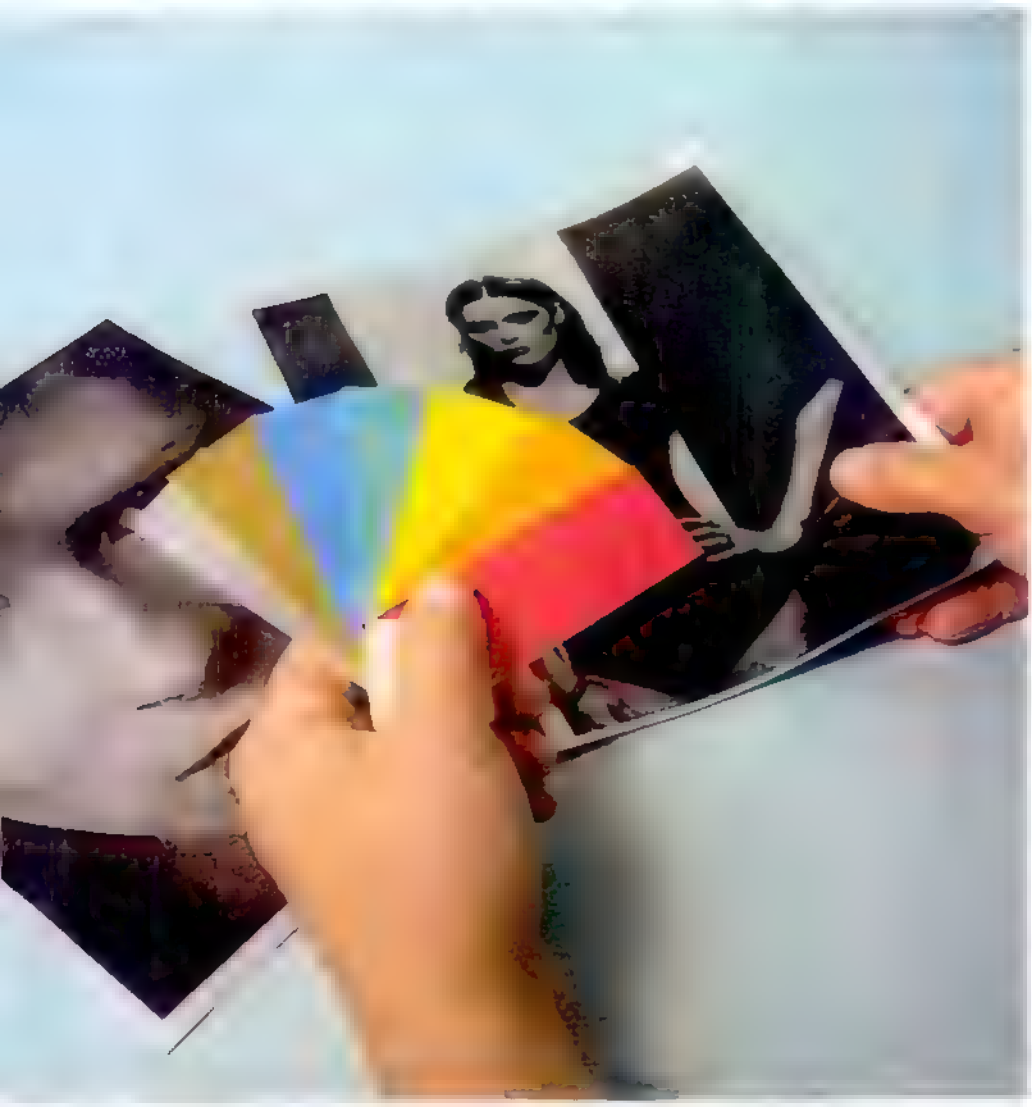
These materials include coloured bromide paper, polyester film, linen and aluminium plates. All are presensitized and can be processed in conventional paper developer. You can print from normal black and white negatives through different [illegible] but disappointing results [illegible] materials have certain limitations [illegible] often come from printing high contrast or soft negatives.

Coloured bromide paper

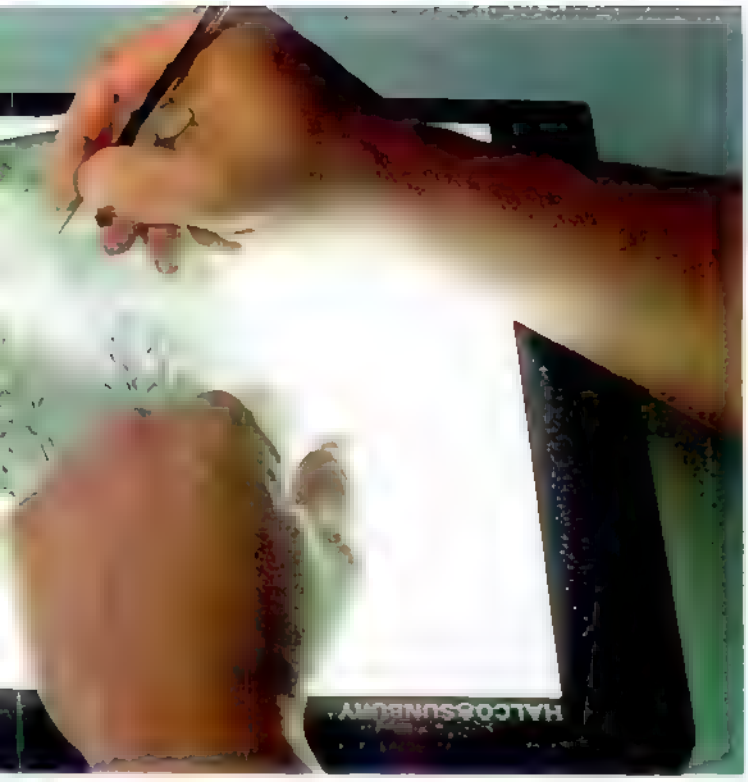
Coloured bromide paper has a conventional emulsion on a coloured paper base. Instead of printing black on a white background, it gives a white image against a coloured background. It is particularly suited to printing high contrast images because it helps to emphasize their graphic quality. Contrasts have negatives do not usually have sufficient contrast to give a good image on this kind of paper. Lith negatives tend to give better results, and front lit prints from lith negatives the effect can be very striking.

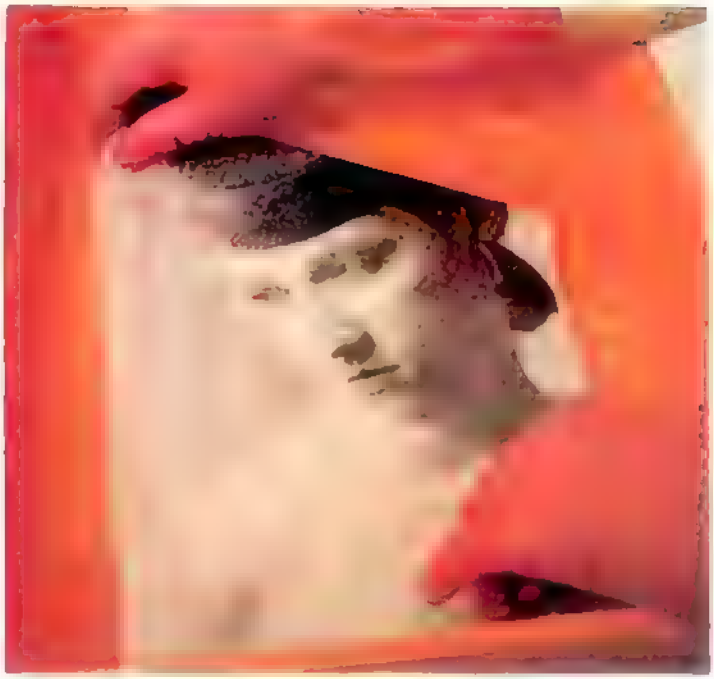
This paper is available in a variety of sizes and in a wide range of colours. As well as pure colours, it comes in fluorescent shades and in metallic or iridescent [illegible] metallic pink and steel blue. You can buy it in large rolls and process it just like conventional paper. It is usually available in silver or gold [illegible] but these high contrast negatives are [illegible] and this is not so important.

Coloured bromide paper is a little slower than black and white paper but it is processed in exactly the same way. It can be handled under a [illegible] red safelight and [illegible] fixed, washed and dried just like any other bromide paper.



Colour choice *The enhanced impact of a coloured paper base suits bold and graphic images best, but will do nothing for an image which is already weak in a normal print. Various papers in normal and fluorescent colours are available. These are processed just like ordinary bromide papers and can be etch-bleached for special effects to yield a white image on a coloured background*





Opaline film *This material is handled and exposed just like ordinary bromide paper but is suitable for both frontlit and backlit applications. It can be coloured on the rear and retouched on its face*

Photo-linen *Sensitized fabric can be used in many ways. The material must be handled carefully to prevent kinks. When dry, it can be used for frontlit or backlit applications. It may be ironed, on low heat, on its reverse side if kinks have to be removed*

Gavin Cochrane materials from John Blishen & Co & Photographic & Technical Services London

Etch-bleaching

An alternative way of processing coloured bromide paper is to etch-bleach it. As its name implies, the process removes part of the print surface, turning it white. The two-part bleach destroys the gelatin wherever there is a silver image, uncovering the white paper base where there was an image and the coloured emulsion where there was not. This technique works best with resin-coated material.

Line work is generally more suitable than half tone for this treatment. Not all colours of paper will bleach, and different brands have different characteristics in this respect. Most metallic colours do not bleach or simply turn back to silver. You must always use fresh paper for this process.

The bleach solution is supplied in the form of chemicals for two solutions, A and B, which are mixed in equal amounts. Working temperatures vary according to brand, and mixed solutions have a working life of about six hours.

When making a print which you intend to etch-bleach, give the paper very full exposure and development. Some makers recommend increasing the exposure by 50 per cent to produce a strong silver image for bleaching. Fix and wash the paper as normal.

Make sure you are wearing rubber gloves before you start the bleaching process. Immerse the print in the bleach and leave it in until the silver image disappears. This should take between 30 and 45 seconds. Try not to agitate the solution—in this way you will prolong its life as the silver is not deposited in it. Remove the paper from the solution gently so that the silver image remains on it and rinse the black image away under a tap. If the image does not disappear completely, put the paper back into the bleach for a further period.

Place the print on a hard flat surface and remove the last traces of silver and gelatin using a brush or a pad of cotton wool. Refix the print, give it a final wash for five minutes, and dry it as normal. When the bleached image is dry you may notice that the colour has become slightly lighter.

By leaving the print in the bleach bath for a shorter time than is necessary to remove the silver image, you can change the blacks into greys rather than whites. Always make sure that you wash all materials thoroughly after use.

Coloured bromide paper has certain advantages over other methods which produce colour from a black and white. It is available in finishes which an ordinary colour paper does not provide and gives a stronger and more consistent colour than obtained by other methods.

On the other hand its use cannot be varied and you are restricted to a fixed range of tones which may not always be suitable for the subject. However, it is essentially different from the techniques of coloured photographic printing because instead of colouring a [illegible] you are producing a bold coloured image with a coloured background.

The technique is an excellent way of giving a powerful mood to a picture. Portraits in appropriate colours such as greens can be very effective, and a landscape can be given added atmosphere on coloured paper. Coloured enlargements look very impressive when framed on the wall, and because they are relatively [illegible] [illegible] [illegible].

Coloured bromide paper [illegible] [illegible] [illegible].

Gavin Cochrane Location courtesy of The Commonwealth Institute

Mounting fabric
You can use a latex type glue for mounting fabric direct on a suitable wooden board

Exhibition
Fabric prints are especially suited to this type of use, being effective and durable

'Opaline' polyester film

Opaline film is an extremely versatile material suitable both for backlighting and for viewing by reflected light. It is a thin translucent plastic coated on one side with a bromide emulsion. Its texture makes it opalescent so that it diffuses light and can be backlit without a diffuser or condenser. It can be easily retouched or coloured with ink, paints or dyes.

One version is matt on both sides but this is primarily for technical use such as making scale enlargements of maps, plans and other line subjects. However the other type, which is glossy on one side, can be used creatively in several ways. Viewed normally it resembles a glossy black and white print but when backlit it becomes a continuous tone monochrome transparency. It can also be coloured on one side so that it looks like a normal black and white print but becomes a coloured transparency when backlit.

You can buy 'Opaline' and other polyester film in sheets, though the smallest size available is about A4. There are various speeds and contrast grades on the market and there is also an orthochromatic type sensitive to green light as well as to blue light.

Polyester film is exposed and processed in exactly the same way as bromide paper. Some films are the same speed as bromide paper but others are faster, so you should make a preliminary test print as described on pages 164 to 167. The information on the film pack should be followed closely for correct exposure.

Develop the film in a dish as usual. Full development takes between 1½ and 2 minutes and as soon as it is over you should transfer the film to a stop bath then fix it normally. If you want to retouch the film, do not add any hardener to the fixing bath as this will harden the gelatin and prevent it from absorbing the dyes. You should then hang the film up to dry in a dust-free place.

To colour the film, first moisten the surface with distilled water until it is slightly tacky. This allows the colour to be taken up more evenly. Albumen dyes are advisable.

Retouching is best carried out on a light box, enabling you to see exactly the effect that it will give when projected.

When mounting polyester film, you should allow for slight heat expansion. It is best to mount the film [illegible] along the top and bottom, or the two sides only, to prevent warping.

The most frequent use for the material is in window displays and exhibitions but there are many ways in which you could use it for your own purpose. A photograph mounted in a frame and placed on a window sill would be backlit by daylight and would look more effective than a straight print. A portrait would be especially enhanced by this form of lighting. You might even try mounting a print on a frame and incorporating it in a [illegible] so that the photograph is lit and [illegible] as a lampshade. Glass doors are another place you could mount a [illegible] transparency. Indeed any place in your home where it can be seen against the light is suitable.

Polyester film costs two or three times as much as conventional bromide paper.

Photo-linen

Another interesting and versatile material is photo-linen. This is a [illegible] sheet coated with a [illegible] emulsion. You can print on it just like bromide paper and like polyester film it can be viewed by reflected light or backlit. [illegible] it returns a durable [illegible] and can be washed and even ironed without fading.

As well as having a unique texture photo-linen is also very strong and elastic. This makes it suitable for many uses in exhibition work and shop window displays where it is often [illegible]. It is very effective when [illegible] deep and because of its flexibility it can be adapted to a variety of [illegible].

You can buy it [illegible] from ten metre rolls to packs of ten sheets in 2½ [illegible] size and [illegible] at [illegible]

the same as con[illegible] It may be white or cream [illegible] semi matt texture The emulsion [illegible] high contrast or normal and has the [illegible] speed as bromide paper. A normal darkroom safelight can be used during processing

You can use any developer suitable for bromide paper to process photo-linen Sheets come in different thicknesses and you should make allowance for this when making the exposure in the enlarger If the linen sheet is thicker than ordinary paper, pre-focus the enlarger on a sheet of thin card or two sheets of paper to make sure that your image will be in focus

Make the exposure and process the sheet in a dish Photo-linen is very pliable when wet, so you can use a relatively small dish If you are developing a very large print, dilute your developer and increase development time in proportion as set out on the pack You should use a stop bath after development, then fix and wash the sheet thoroughly

Prints should be air dried whenever possible. Large ones should be pegged to a line or stretched out on an adjustable frame, while small ones may be dried on a print drying drum

When dry, photo-linen may be ironed on the reverse side with a heat-controlled iron. You can mount it with a latex rubber type glue, or sew it into place Once dry, it remains pliable but is stiffer than when wet. If you want it to remain very flexible, give it a final rinse in a solution of one part glycerine to two parts water

Photo-linen is used in interior decoration for curtains, wall coverings and drapes, and attractive effects can be produced by lighting from behind with fluorescent tubes Theatre and film sets use it and it is especially effective if backlit with coloured light for special effects on stage An enlargement can be coloured in by hand with oil [illegible] dyes so that a photograph loo[illegible] painting Alternatively, you could use a photograph as a base for a painting in its own right or for a whole range of artistic and graphic effects

However, perhaps its most rewarding use is in simple photographic printing As a texture it is unique, and many kinds of pictures are suitable for printing on linen Portraits especially benefit from this kind of treatment as the roughness of the surface contrasts very well with the smooth gradation of tones given by the emulsion. At the opposite extreme, prints on linen from lith negatives are also very attractive, giving an effect rather like an engraving or a woodcut.

Printing on aluminium

You can even print your negatives on aluminium plates which have been made sensitive to light These have various industrial applications, but they can be used very creatively for printing and graphic effects. They can reproduce both line and continuous tone work, giving very fine resolution

There are various surfaces and thicknesses available. The plates are sensitized with a hard (grade 3) emulsion and since they are orthochromatic they must be used under a red safelight. They may be matt, semi-matt or glossy, and you can buy sizes as small as 9 × 12 cm

Like the other surfaces, aluminium plates are exposed and processed in the same way as bromide paper using a normal enlarger or contact printer. Any bromide developer can be used provided it does not contain caustic soda

When you are exposing the plate [illegible]nber that it may be thicker than paper so you must make allowance for [illegible] when focusing and preparing the [illegible]l. You might also try contact printing [illegible] an enlarged negative. With lith film you would do this anyway

You should dry the plate on a draining rack. For maximum durability spray the dry plate with a special varnish which protects it from damage

Aluminium plates have many uses. In the industrial field they are used for nameplates, instrument panels and dials in circumstances where a small number only are required and etching or screen printing would be too costly

They are equally suitable for reproducing line, half-tone and continuous-tone images, and give very dense blacks with dull, metallic grey highlights. A print on an aluminium plate has a characteristic sharp quality with very high contrast. Image resolution is excellent showing very fine line and tone detail The most delicate, soft areas of tone are faithfully reproduced, but with heightened contrast. For special effects you can even dye the metal.

A large aluminium print from a lith negative has a striking appearance rather like a print on metallic bromide paper but with a glossier surface Aluminium prints with matt surfaces are suitable for framing and hanging on the wall as their surface does not catch the light too badly

By contact printing with cardboard masks or plastic letters, you might also use aluminium plates for labelling or whenever you require neat, clear lettering on a durable base

Processing technique *Sensitized metal scratches easily and it is best to suspend the plate carefully in the processing solutions. Gloves should be used*

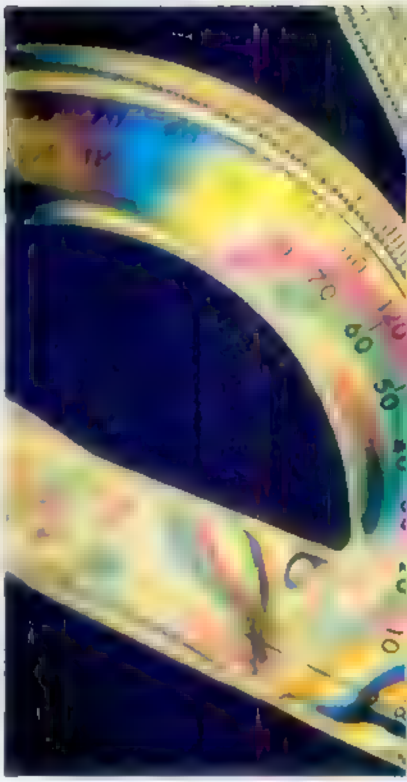
Gavin Cochrane/Metone available from John Bisson

Finished result *The processed plate should be rinsed in a final bath containing wetting agent, then air dried. The plate can be used in a variety of unusual applications*

Understanding...

Polarized light

Light is a complex phenomenon. Colour is only one of several aspects important to photographers. Another crucial feature concerns the way in which the light waves vibrate



Stress patterns *Crossed polarizers can be used to reveal stresses in plastic*

Most people are familiar with polarizing filters, either as used for photography, or as lenses in sunglasses. The way they reduce haze and reflections is useful in both applications. While in the case of photography they can also help to produce more saturated colours, but polarizers do not work in the same way as other filters and to understand polarization it is necessary to look again at the nature of light.

There are two aspects of light which are important when filters are involved: wavelength (or colour) and polarization (or direction). Coloured filters work by restricting the wavelengths of light which can pass through them. Polarizers, on the other hand, affect the direction.

Light can be treated as a wave motion. One way to visualize the wave form is to imagine a [illegible] held taut at one end and held at the other. By shaking the end of the [illegible] a wave pattern [illegible]. The amplitude is the height of the wave peaks which is measured from the central point of the [illegible]. As extra energy is applied the amplitude [illegible] direction. The [illegible] [illegible] which [illegible].

Viewed from one end, the [illegible] appears as if vibrating in one plane only. Light which vibrates in this manner is called plane or linear polarized light. But except in special circumstances, light vibrates in many planes and so is unpolarized.

Types of filter

A beam of light can be polarized by using special filters. These work by restricting the plane of vibration of the light passing through them. Linear polarizers usually consist of [illegible] which [illegible] [illegible]. The [illegible] forms very closely spaced [illegible] which act as conducting paths to absorb light of a certain polarization.

When a filter transmits light waves vibrating in one direction [illegible] [illegible] light waves at planes between these two are transmitted in varying amounts. Light which has been polarized in one direction cannot pass through a filter oriented at 90° to it. The exception is deep blue light which is less strongly affected by the filter. Filters are usually set in rotating mounts so that the plane of polarization can be changed.

The optical properties of polarizing filters are not perfect. More than half the incident light is absorbed, giving a filter factor of [illegible] to [illegible]. In addition, some filters are not truly neutral in colour and may need a weak colour compensating filter for really critical colour work.

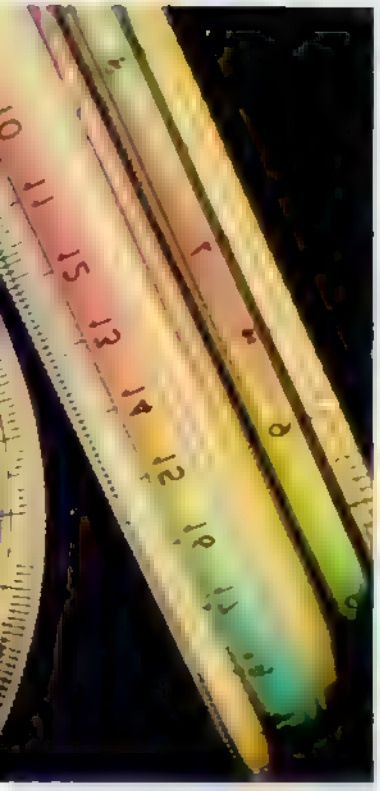
There are two filter types of polarization: linear and circular. When viewed end on the polarized wave forms these shapes. But viewed in perspective the path of the wave is actually a helix (corkscrew shape). As a result, the light can be right hand or left hand polarized according to the direction of the rotation. Left hand polarized light cannot pass through a right hand polarized filter and vice versa.

Circular polarizers work by including, in addition to the polarizer, a layer of *birefringent* material. This is material which [illegible] the plane of polarization. Light from the [illegible] passes through the polarizer so that it is polarized. It then passes through the birefringent material and emerges circularly polarized. This is an advantage with cameras that use a [illegible] type of TTL light meter (see page [illegible]).

Natural polarization

Polarizing filters are [illegible] [illegible] [illegible]. If a beam of light strikes a flat, smooth, nonmetallic surface at an angle the reflected light [illegible] [illegible]. [illegible] [illegible] [illegible] degree [illegible] on both the angle at which the light strikes and the refractive index of the material that reflects it [illegible] power.

[illegible] [illegible] [illegible] polarized light [illegible] [illegible] filter can [illegible] [illegible] of the reflected light [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] components of light vibrating in the correct plane.



Paul Brierley

There are other photographic applications of polarized light, apart from eliminating reflections. Some quite ordinary materials, such as perspex and cellophane, are birefringent and can be used to produce colourful and dramatic pictures. An item made from one of these (such as a perspex ruler) placed between crossed polarizers forms multi-coloured fringes within the material These are produced by stresses in the object, so that various wavelengths of light are affected in different ways The result is an apparently luminous object standing out against a black background

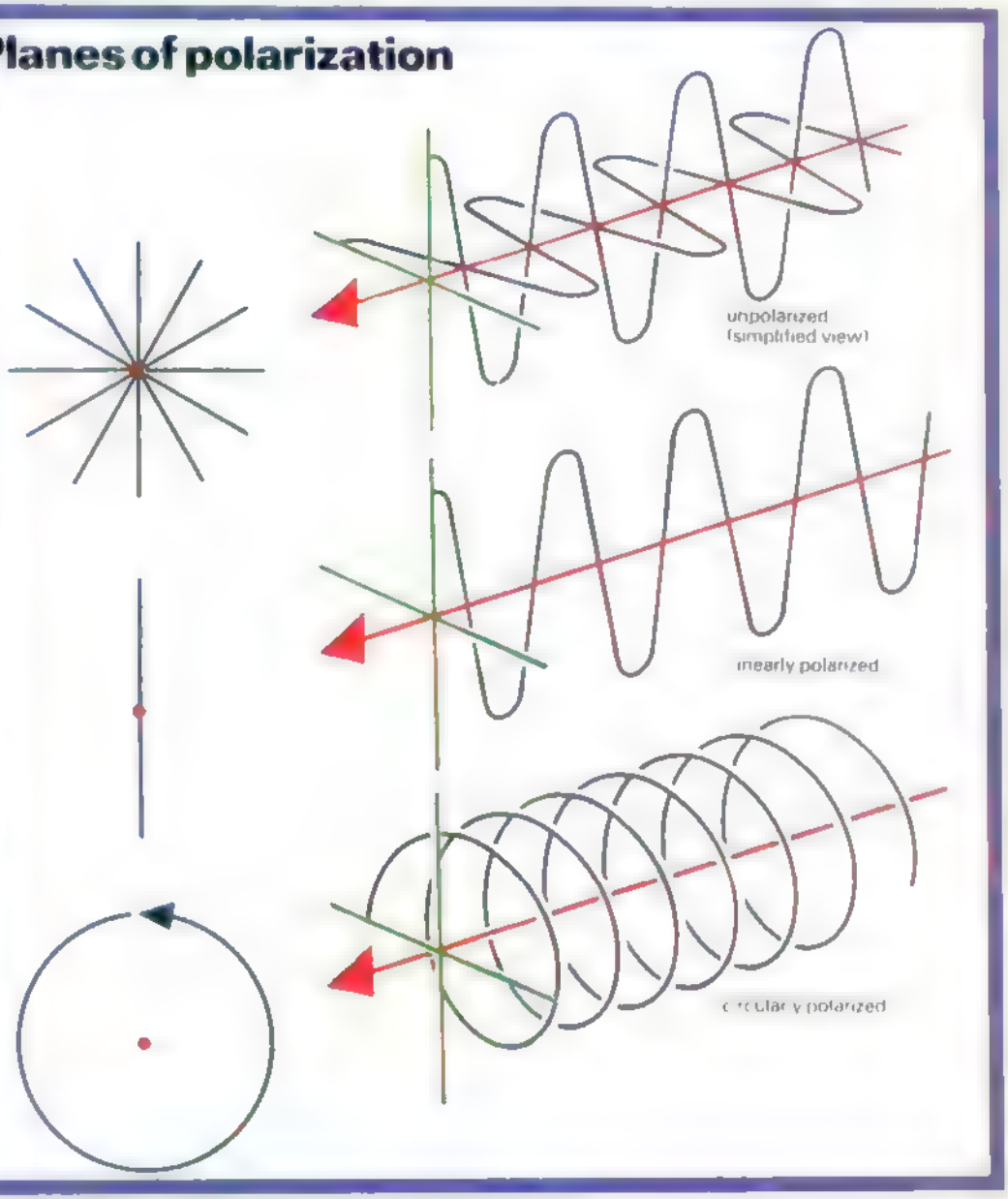
Wave vibration *Unpolarized light vibrates in many planes. Polarizers restrict the vibration to one plane*

Natural light scattered by small particles, such as dust or gas molecules, may be polarized. The best example is blue sky. The light from an area of sky is polarized, the extent varying according to its location—the strongest effect is at 90° to the sun. A polarizing filter can remove some of this light to increase the colour saturation of the sky, or simply to make it appear darker.

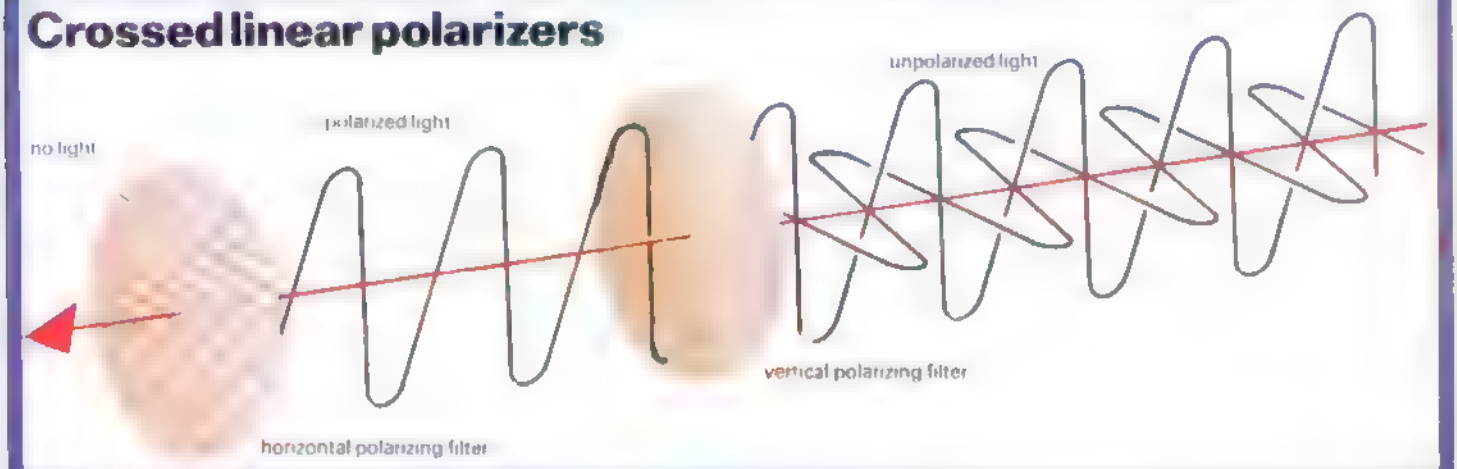
In some cases, such as with a matt or dusty surface, polarized light can be depolarized by reflection. In the case of circularly polarized light, reflection can cause a change in the direction of the rotation

Opposed planes *Crossed polarizers prevent light from passing through them*

Planes of polarization



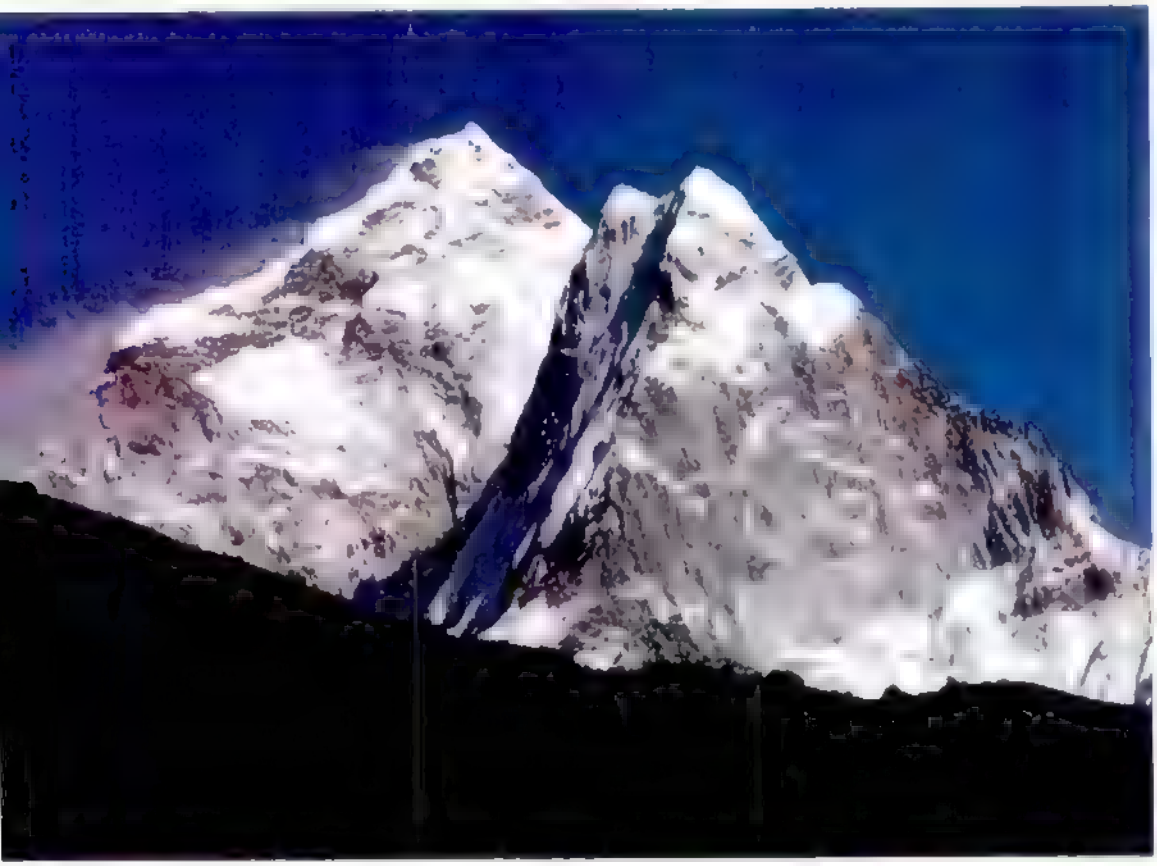
Crossed linear polarizers



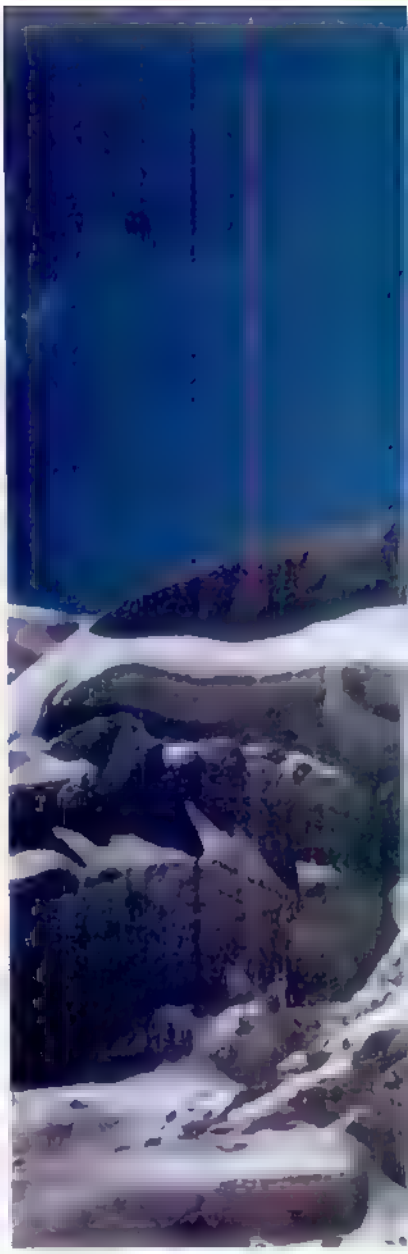
Advertising Arts

Mountainscapes

Offering breathtaking scenic views, spectacular panoramas and impressive detail shots, mountainscapes are ideal for the adventurous photographer



Alfred Gregory



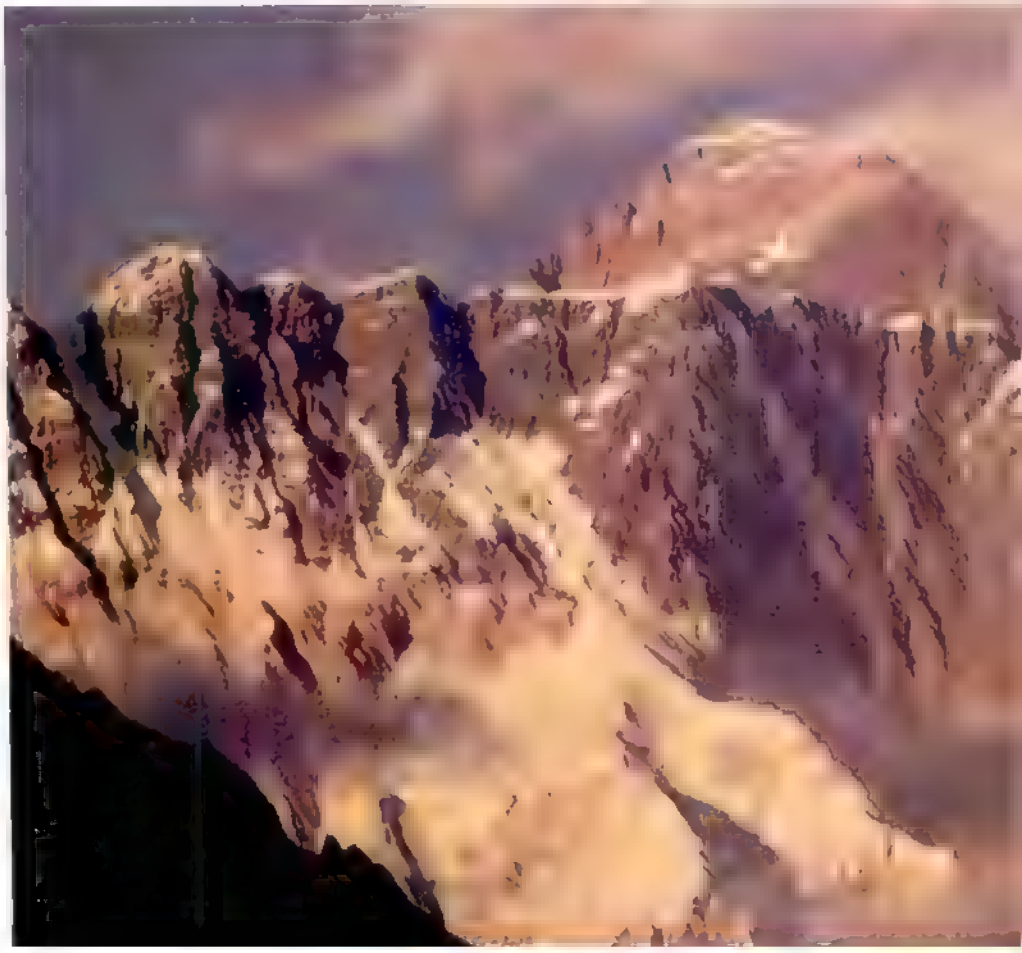
Suzanne Hill

Some people encounter mountains only rarely, on a skiing holiday or on a holiday visit. Others may live near a mountain range and are able to photograph it at all its moods. Either way, mountains offer the potential for breathtaking photographs.

Not to record the topographical landscapes it is essential to capture the 'mood' of the mountain rather than simply the summit. Climbing may not be involved at all as some of the most dramatic views are those seen from far away. However, it needs considerable skill to turn a good view into an impressive shot rather than a busy, shapeless landscape with no real centre of interest.

Think carefully about the aspects of mountainscapes that interest you most. These will naturally be dictated by what the subject has to offer. European ski slopes and their mountain ranges are quite a different proposition from rocky desert outcrops, though their basic shape means some of the same techniques are necessary. But the moment you choose to photograph them, your location and the choice of lenses, filters and film are under your control.

The choice of filter and white or colour film, for instance, will be dictated by the type of atmosphere you want to



Twin peaks *Deep foreground shadow is used to focus attention on these snowy peaks.* **Snowcap** *Careful exposure will reveal subtle patterns in the snow* **Mount Everest** *Late afternoon light brings a warmer colour to mountains*

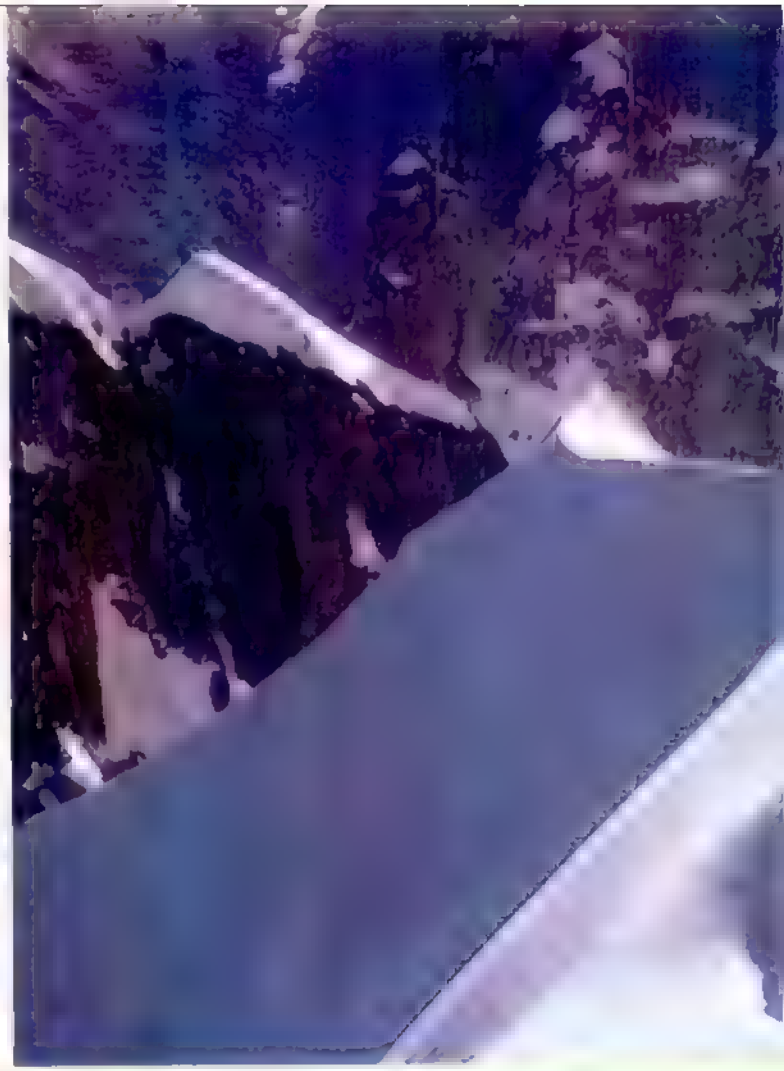
[illegible] ents of the [illegible] of the [illegible] white cloud[illegible]

If you intend [illegible] allo[illegible] the surrounding ar[illegible] [illegible]ations from a number of different viewpoints and under different lighting conditions. The time will not [illegible] if you are [illegible] [illegible] [illegible] weather.

[illegible] revealing a high [illegible] Dramatic effects [illegible] [illegible]rises can be [illegible] If you intend to [illegible] filtere[illegible] particularly at sunset, but it [illegible] better to confine this to the odd [illegible] [illegible] become [illegible]

[illegible] ry for [illegible] ful mountainscap[illegible] [illegible] ffective phot[illegible] [illegible] rapid [illegible] en at low [illegible] for torren[illegible] While it [illegible] ough, let [illegible] tograph, in log[illegible] [illegible] great effe[illegible] [illegible] heric mountainsc[illegible] [illegible] clarity and detail in [illegible] age, but you will gain a much [illegible] picture

Alfred Gregory



Mountains and flowers ***A bright, sharp foreground colour contrasts well with a misty mountainscape beyond***

M. P. L. Fogden, Oxford Scientific Films

Certain times of day are characterized by misty conditions, especially summer mornings after a heavy dew deposit and winter evenings after a clear day. On these occasions you must pay careful attention to colour balance but often you will be able to achieve slightly unusual colour effects which are perfectly acceptable without being absolutely accurate. The colours and linear patterns produced when early morning sun stream es through heavy mist are in themselves unusual and can create striking images. Remember that the misty effect can be enhanced by slightly over-exposing and that this has a tendency to desaturate the colours.

A sudden change in the weather or light can alter your subject tremendously occasionally revealing a superb view in what had previously been an uninspiring scene. You should also be aware of the change in the seasons. If you find a particularly good view, you may be able to return at different times of the year to record the changes.

One of the most difficult impressions for the camera to record is that of the actual size and scale of the mountains themselves. There are several ways in which to suggest this – one of the most effective is to include other objects in your composition which relate to the size of the mountain. Tiny figures located on a stony peak for instance

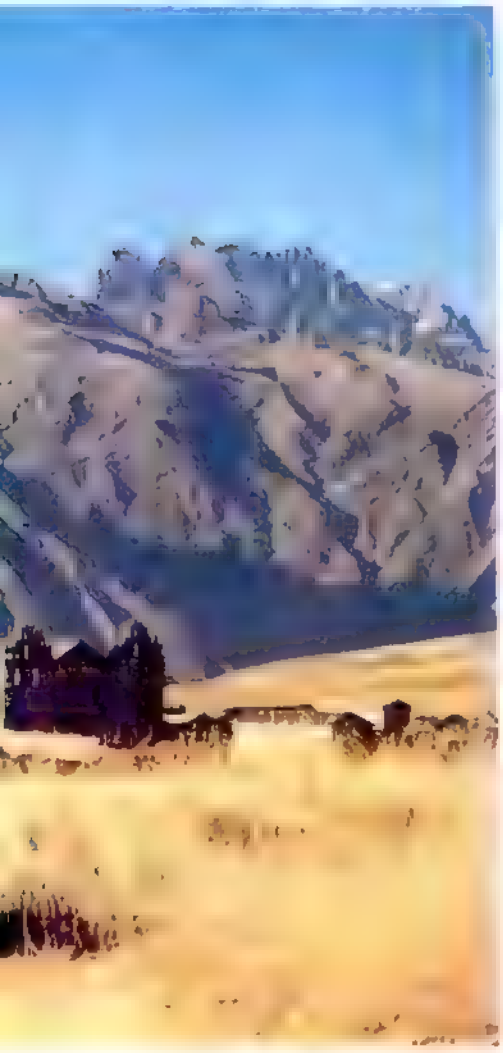
Alan Gregory

will help to give a sense of the mountain's scale of the mountain and a sense of the challenge and danger associated with mountain climbing. A low level at the foot of a mountain can be photographed so that the mountain appears to tower over it. This type of shot is best achieved with a telephoto lens from a distance. Although some sense of depth may be lost in the photograph a dramatic image I can be achieved in this way.

It is not easy to represent both scale and depth very effectively in a mountain scene. Usually the introduction of foreground will increase the feeling of depth and may hinder the relative sizes of near and distant objects. The amount increased in the foreground will be determined largely by your viewpoint.

A low viewpoint will exaggerate the size of close objects and will give a good sense of depth as the eye is led towards the main mountain by a series of foreground and mid ground objects. A higher viewpoint may tend to exclude objects in the foreground but will provide greater scope for a panoramic view over the middle and far distance.

Wide angle lenses require considerable experience and care when used in shooting mountains as they can reduce an impressive range to a few tiny row. They are best reserved for shots taken fairly close to an isolated mountain peak when the foreground



Brian Morris

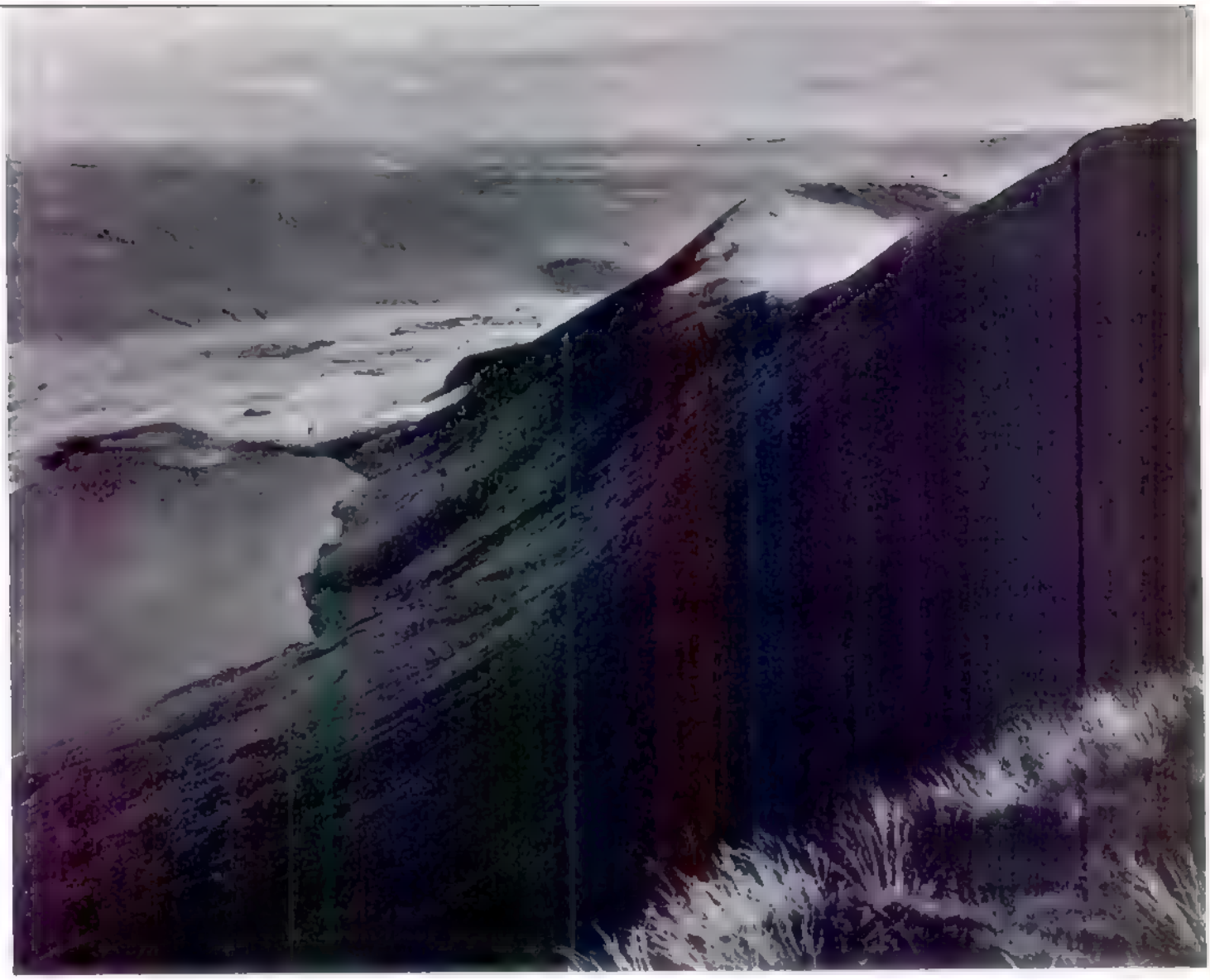
detail is extremely interesting.

A telephoto lens on the other hand allows a more distant viewpoint enabling you to isolate certain interesting features of the mountain as the main subject in your picture. The summit for instance may be one of those strange crooked needle shapes which are not easily seen when you are close to the mountain since your angle of view may be restricted. In this case a better shot

Mountaineers *These minute figures on a ridge give an impression of both scale and of man's vulnerability*

Caribou *An out of focus and distant mountain range suggests the animal's environment effectively*

Church and cactus *Strong foreground subjects which contrast in shape and colour give interest to the dark hills*



Paul Joyce

Black Mountains *Choosing black and white film for certain subjects will give you a much more dramatic effect than can be achieved with colour*

could be achieved from a distance with a telephoto.

Once you have examined your subject from a distance and from varying heights as well, you may feel that it is time to move closer and concentrate the picture possibilities from the bottom of the mountain itself. At this point, particularly if it is a steep mountain with no easy approach rather than a rolling hill, [illegible] attention to your walking and climbing equipment. When comfortable transport [illegible] weight becomes the most important factor [illegible] so you must think carefully about the equipment you are going to take [illegible] with [illegible] and a telephoto lens. Take plenty of film and a lightweight tripod.

As you approach the base of the mountain the first thing you may notice is that the summit [illegible] from view. The foothills may not be the best place for [illegible] but [illegible] interesting subjects to contrast with what can be seen of the mountain in the background. For instance the lower slopes may be cultivated and you can contrast the neatly ordered and [illegible] sloping fields with the jagged [illegible] face above. A lake is a [illegible] foreground for a mountainscape, with the mountain's reflection adding to the interest of the picture. As you ascend to higher levels you may come across rushing streams or waterfalls. Both make excellent foreground subjects to contrast with a [illegible] mountainscape beyond.

Although scenery is your immediate priority, do not neglect opportunities for adding human interest to your photographs. Hikers, climbers or [illegible] can add [illegible] colour and interest to a mountain picture and their relationship to the mountain is also an aspect worth exploring.

If you decide to go above the snow line bear in mind that you will probably encounter mist and cloud. These conditions can produce [illegible] shots but at this level mountains are dangerous places and you should be equipped with at least a compass and a map. Try to get shots which give a real feeling of the height you have achieved. As you shoot downwards from the edge of a steep cliff the verticals will seem to distort. If they are used [illegible] they will add to great effect in the picture, increasing the impression of height.

If you are at snow level, try to [illegible] in your shots. A [illegible] can be [illegible] effective [illegible] correctly [illegible]. Experiment with time exposures [illegible]. Use the tripod and [illegible]. If you have time to [illegible] the [illegible] that you [illegible] them [illegible] view.

The actual summit of a mountain is usually a barren and [illegible] place. Trees rarely take hold there, and the vegetation is sparse. However, you may encounter some [illegible] which manage to exist at high levels and these can make interesting [illegible] for the photographer with [illegible].

The higher you proceed the colder it will get and the wind [illegible] it [illegible] freezing [illegible] the [illegible] so that the film will not [illegible] cold [illegible] in extreme [illegible] and black and white is more [illegible] in these conditions.

Take advantage of these high points for views of other mountains and peaks. You [illegible] perspective [illegible] than [illegible] for the [illegible] of photographs [illegible] will [illegible] that [illegible] the [illegible] of [illegible] and [illegible].

Motocross

Dynamic action and bright colour combine to make motocross one of the most exciting sports for photographers and spectators alike

Into the turn *Jack used a 135 mm lens and a shutter speed of 1/500 sec. By including two riders, a sense of competition has been created* **World Champion** *An 85 mm lens is useful for portraits of the riders*

Riding gear *There is more to shoot than the riders and their machines —here, Jack used his 85 mm lens for this almost abstract shot of some clothing outside a rider's tent* **Supporters** *The teams and the crowds are also promising subjects*

Head over heels *By 'reading the race' you have a better chance of anticipating where dramatic moments are likely to occur.* **Foot down** *A medium telephoto lens and a good vantage point allowed Jack to fill the frame with bike and rider*

Specialist colour films

Some types of film are designed for specialist or professional use. How do they differ from 'ordinary' films—and what exactly do they have to offer the amateur?

Film: Special films, courtesy of Kodak & Agfa

Special films *for special purposes*
A wide range of such films is available, most of them produced by Kodak. Each is designed for a specific purpose and would give widely different results if used to photograph identical subjects

'Professional' films

[illegible]

Professional films on the other hand are designed to give their best performance shortly after manufacture. They must be stored at low temperatures in order that they maintain the optimum performance and, once they have been from storage they should be used within a short time that processed very soon afterwards to prevent fading of the latent image or latent image progression. These are the conditions under which most professionals work and the films therefore give highly consistent results.

In addition to the factors above each batch of professional film is provided with specific speed data by the manufacturer [illegible] professional film for example [illegible] speed at an ASA [illegible] at say 25 ASA. Manufacturers also provide supplementary data information with professional films. [illegible] sometimes a correction factor [illegible] suggested for a [illegible] film for use in [illegible]

Some professional films are described as Type S or Type L. These are designed for either short or long exposure respectively. [illegible] are [illegible] light conditions [illegible] used in [illegible] purposes to advertising [illegible] range [illegible] hands by both [illegible] and [illegible] be either [illegible]

Infrared colour film

Perhaps the most popular [illegible] available to the amateur is Kodak Ektachrome Infrared film. Intended for military, land survey, medical and [illegible]

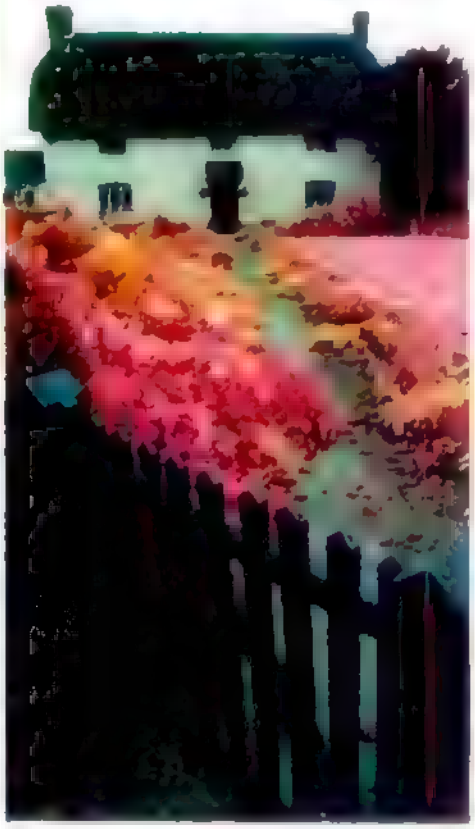
Its three colour [illegible] provides the [illegible] sensitivity of each [illegible] spectrum. Instead of [illegible] green and red [illegible] to green, red and infrared. The film should be used with a Wratten [illegible] to remove blue light.

[illegible]

The film is available in the [illegible]

Michael Newton

Infrared film *The infrared shot (below) emphasizes the high infrared reflectiveness of vegetation which appears green on normal film (left)*

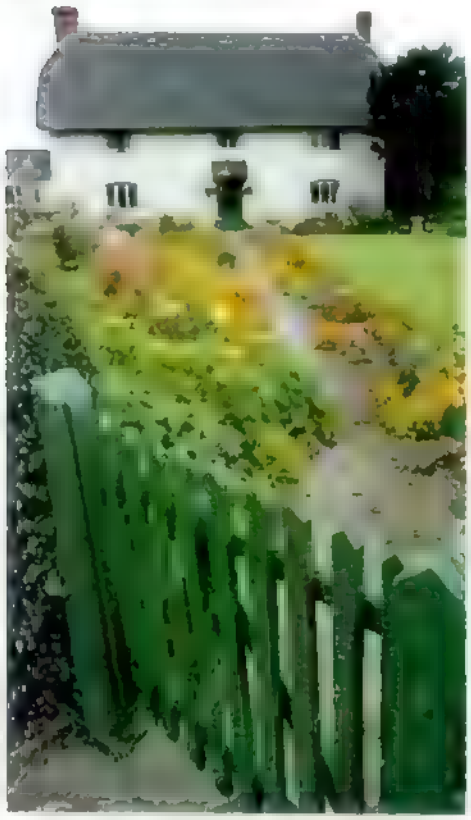


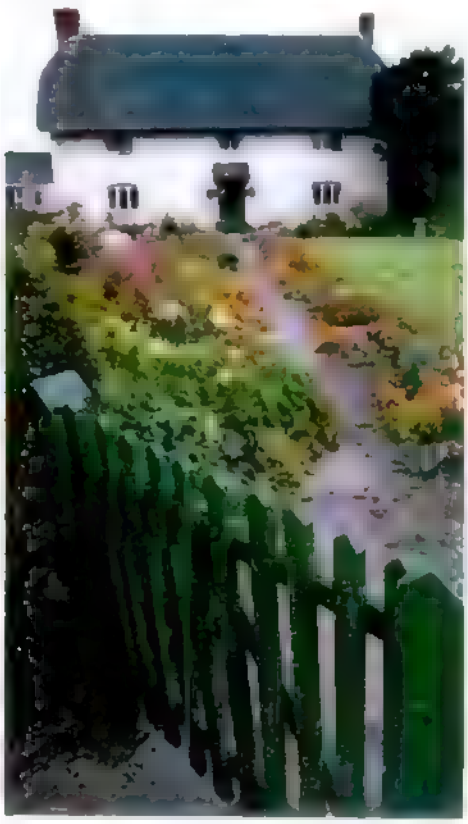
Photomicrography film

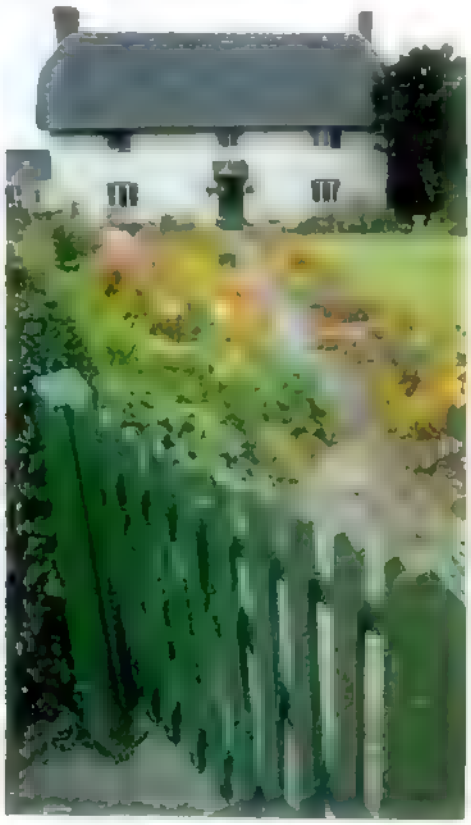
Slide duplicating film

Internegative film

Photomicrography film *(below) used for photographing low contrast images through a microscope, produces more contrasty pictures than normal film (left)*







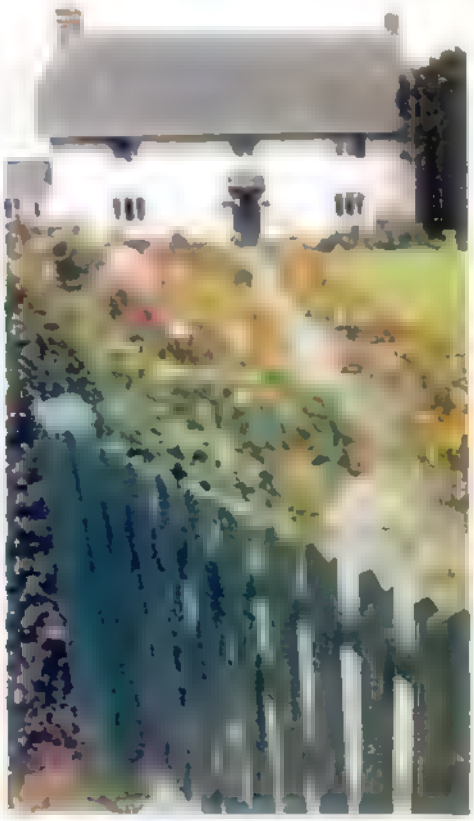
Michael Newton

Vericolor Slide Film 5072

Slide duplicating film *(below) is intended for photographing high contrast slides and the results are lower in contrast than normal film (left)*

Kodak 5247 film

Kodak 5247 film *(below) produces acceptable images but they lack the sharpness and clarity of those taken on normal film (left)*



Setting up a studio

For a careful controlled approach to your subject, a studio is a must. But it need not be a permanent fixture – even a corner of a room will do. So how can you set up a room for studio use?

Kim Saver

Full time studio *If you have a big house, you may be able to convert one room into a permanent studio.*
Tungsten or flash? *Quartz lamps are cheaper to buy, but get very hot and cost more to run than flash.*

A studio at home

Choosing a room

Studio at home
You can set up a studio with a minimum of equipment and space. Often it is just a question of pushing the furniture aside and setting up a couple of lights. The room can be quickly restored to its normal role when the session is finished.

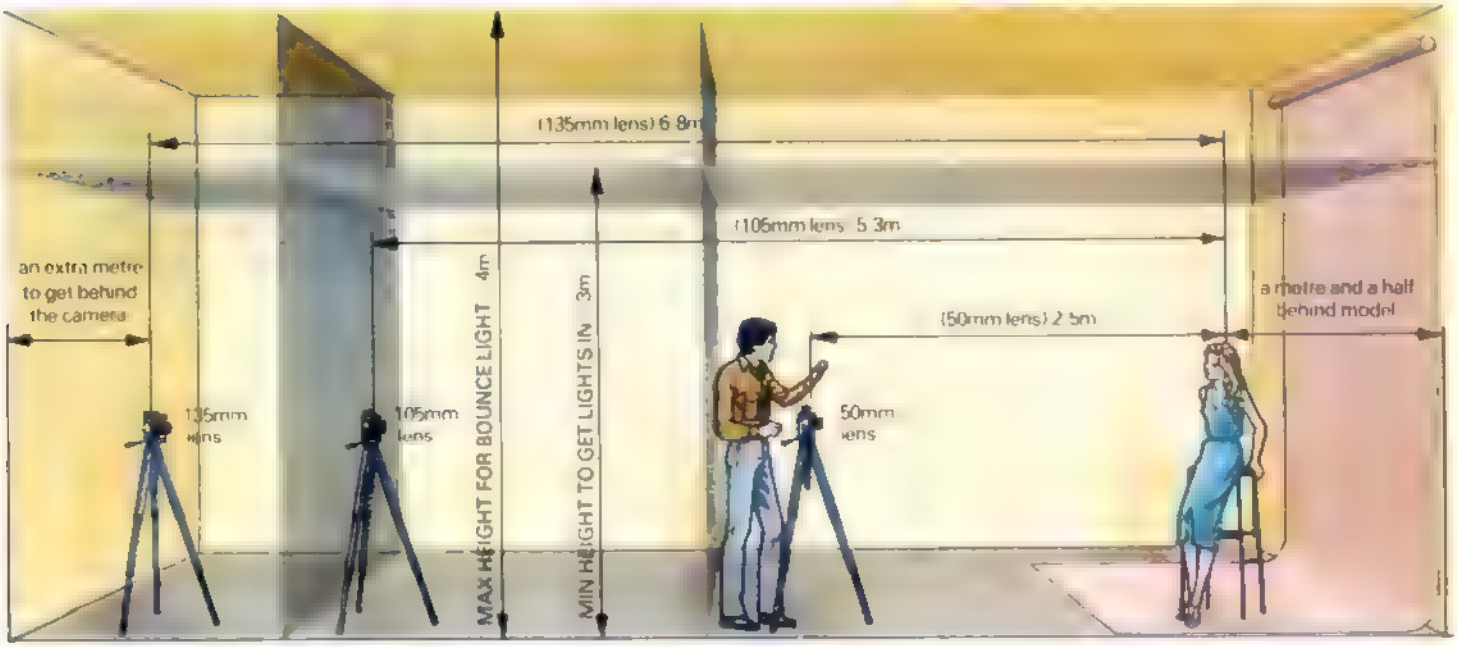
The ideal size
A bigger studio gives you scope to shoot with longer lenses

size so that they will fit [illegible] but this is rather expensive [illegible]

The size of your room will [illegible] the [illegible] you can [illegible] but it will also influence the [illegible] of the [illegible] space that it will take [illegible] standard full length portrait. With a [illegible] camera tilted [illegible] and filled with a standard [illegible] the head and feet of an average standing figure will be tightly framed when the camera is 2.[illegible] metres away. With the [illegible] and a [illegible] lens the camera can be positioned [illegible] metres away and with a 135mm lens 6.8 metres. These [illegible] are not true to [illegible] but allow no space for the photographer to get behind the camera. There must be sufficient space behind for [illegible] so that shadows [illegible] on the background which [illegible] separately. Allow an extra metre behind the camera and at least [illegible] metres behind the model. Further [illegible] framing the shot needs to be even longer by a metre or two.

There is no real alternative to using wide angle if you want to have the perfect focal length lenses. It is no [illegible] to choose a short focal length or a wide angle because the subject will [illegible] perspective distortion of the [illegible]. Compare the two portraits on page [illegible] and you will see that the photographer, using a telephoto lens, is far [illegible] the subject. But the other portrait [illegible] with a very wide angle lens. If the photographer would [illegible] for not using a wide angle lens is that such a lens sees more [illegible] and – what you would [illegible] – [illegible]. A long lens though gives you more room for manoeuvre and prevents the edges of the background creeping in on each side of the picture.

If you do not have a [illegible] available remember that you can shoot through an open doorway for the occasional full length portrait. This has the added advantage that the doorway



Jeremy Gower

Equipment storage *Even in a home studio, it is important to have all the essential acessories close at hand*

acts as a very deep lens hood, cutting out any stray light

A studio that is too long or wide is rarely a handicap but a ceiling that is too high can cause problems. It is useful to have a fairly low white painted ceiling so that you can bounce light off it. Light bounced from a ceiling, like bounced flash, gives very pleasant soft illumination but if the ceiling is higher than about four metres bounced lighting effects become more or less impractical.

On the other hand, a very low ceiling may be restrictive—sometimes you may need to put a light above a model.

The ideal room to use as a studio then is at least five metres wide, nine metres long and three to four metres high. A balcony is a useful feature because it makes top shots—pictures from above—much easier to achieve. Natural light from two sides is an advantage, but not essential, and it is quite feasible to rely entirely on electric light.

Flash or tungsten ?

One of the most important decisions facing a photographer setting up a studio is whether to use tungsten lights or electronic flash. Both have their advantages: tungsten lights are cheaper to buy than studio flash units but consume more electric power. Electronic flash freezes all action in the picture but without Polaroid tests it is difficult to see whether the lighting and exposure are correct. Tungsten lights give off more heat than electronic flash units but are more reliable.

Perhaps the biggest factor is cost: studio flash units are too expensive to justify the outlay unless you use them very regularly. If you are working on a low budget or have a lot to learn about lighting, it is probably better to buy tungsten units.

Tungsten lights are available in many forms. The cheapest are the type shown on pages 238 to 241: but these can only be used with quite low power photoflood bulbs. Although they are suitable for lighting at close quarters, the level of illumination from them drops considerably when they are moved back from the subject. This means that unless you use a lot of lights, long exposures at quite large apertures are sometimes needed.

Professional photographers rarely use photoflood bulbs for tungsten lighting instead many prefer quartz tungsten lighting units. These take small tubes instead of bulbs and usually have a power output of [illegible] watts. Professional quartz lighting units are fairly expensive but movie lights which take the same lamps are just as powerful and much cheaper. Check before you buy that the lights can be used for continuous running, and not just intermittently.

Quartz lights do not accept interchangeable reflectors though some of them have a variable beam angle. Lighting effects must be controlled by using umbrellas, diffusers, or reflector sheets. Although this may seem more complicated than swapping from one

Useful equipment

Besides the basic fixtures and fittings for a studio, there is a whole range of small items that can be useful around the studio. Many are ordinary domestic tools or utensils, others are quite specialized. The list is not comprehensive and no single item is essential. However, all of the following items should help you get the best out of your studio and are all quite cheap.

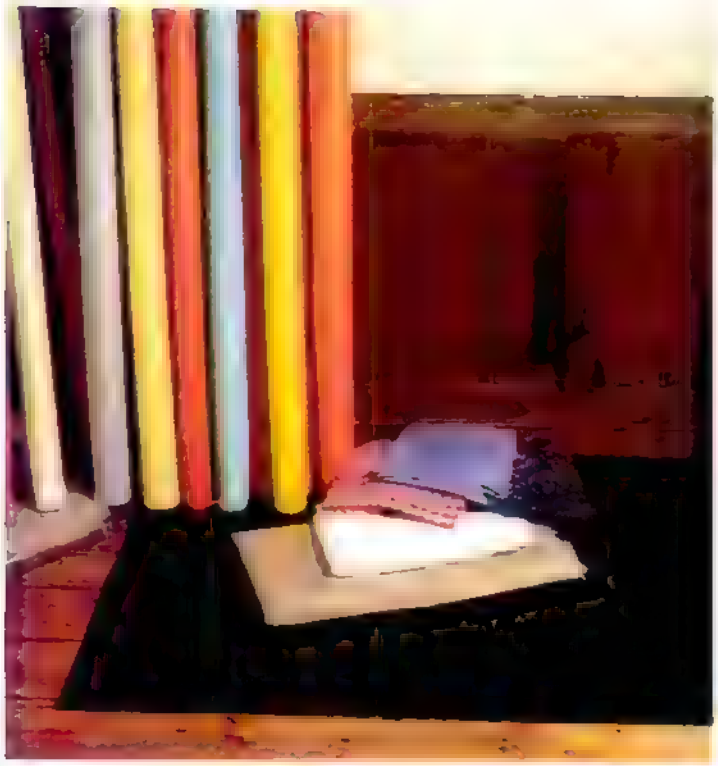
Supporting, sticking and fixing: a general purpose tool kit comes in very handy for holding bits of a set or background together. Six house bricks can be used as supports or weights. A theatrical stage weight, or any heavy lump of metal is useful for similar purposes. A beer crate is good for standing on or to give a bit of extra height to a prop, and a laboratory retort stand can be used to support an object at any height or angle. Double-sided tape is invaluable for adjusting or fixing the position of props as is a plasticene type adhesive. Conventional tape, such as black PVC, or heavy carpet tape, has a thousand uses in the studio.

Lighting aids: reflectors of various sorts are essential. Large sheets of expanded polystyrene need very little support, and make excellent reflectors. Foil covered card, either high gloss or dull matt can be cut up and concealed in a still life to lighten shadows. Diffusers made of acrylic or tracing paper stretched on a frame, allow careful control of light. (Some diffusing material comes in a deep blue colour equivalent to an 80A filter, and converts tungsten light to daylight colour.) Black velvet stretched on a frame can be used to take light out of a portrait. Double-sided spring clips can be used instead of barn doors to 'flag' a light and prevent it shining into the lens. A *French flag* has a similar function but is attached to a tripod with a clamp.

Electrical leads and a long extension cable are essential, but tend to get snarled up. Store them in small fabric bags so that they are out of the way, but easily accessible. A peg board or a plastic rack such as those used for storing vegetables is useful for storing odd bits, but a wheeled trolley is better. Cover the shelves in ribbed rubber mat, so that lenses and other items do not roll around—a raised lip stops them falling off altogether.

For still life work, a dulling spray is very useful. This puts a fine matt lacquer on to shiny objects, so that they do not flare into the lens. A sheet of plate glass is a necessity if you photograph glassware, as it allows you to light from below.

Finally, do not neglect safety, particularly with hot tungsten lamps. Buy a fire extinguisher of the foam type—water is dangerous where there is electrical equipment in the room. A small step ladder is much safer to stand on than a wobbly chair or stool, and can double as a projector stand—but make sure all four legs are firmly on the ground.



Bold backgrounds
Seamless paper rolls come in many colours, but scraps of fabric are just as useful, and have more texture

Lighting aids
A French flag (fixed to the tripod) stops light shining into the lens, and black, silver and diffusion sheets help to control lighting

Kim Sayer

Useful tools
All sorts of non photographic items have a use in the studio

dished aluminium reflector [illegible] can provide a more versatile method of lighting the subject. It also costs pennies to make; diffusers can be made cheaply and easily at home.

If you decide to use electronic flash, it is worth considering the purchase of a small, inexpensive studio flash unit. Unlike portable flashguns, these studio units have a modelling bulb close to the flash tube, and this gives you some indication of how the light changes when the model or the flash is moved. Portable flashguns are difficult to use in the studio because you cannot see how light is falling on the model. You are working in the dark.

Better backgrounds

Rolls of seamless background paper are ideal for portraits and many other types of photography. By concealing distracting details, they draw attention to the main subject and, with careful lighting, can make the join between the floor and wall of the studio invisible. Background rolls come in a wide range of colours, but if you buy a roll of white paper you can use coloured gels over the lights to provide variations of hue. The paper is sold in lengths of 11 or 25 metres and [illegible] which can be supported. Though special [illegible] are available for this purpose, you can easily use a broom handle, a simple set of pulleys and a length of rope to raise and lower the paper.

For some purposes, paper rolls are unsatisfactory – some photographers feel they are featureless, bland and lacking in character. If you want a background with some texture in it, lengths of fabric make a useful studio accessory. With a [illegible] mm lens, you only need a piece of fabric one metre square for a background to a head and shoulders portrait, and this sort of length can easily be bought as an end of roll remnant at very low cost.

Wood and plastic laminate panels make very good backgrounds, too, if you have enough room to store them. Plastic laminate wipes clean and is waterproof and textured. It [illegible] for [illegible] paper, and though the matte finish is rather [illegible] it can work well enough in the right hands.

Whatever sort of background you use, it is convenient to be able to fix it to the floor so that it does not move out in draughts or when someone walks past. If you have a wooden floor, this is a simple matter: you can staple it down or put pins or nails through it. If your studio floor is solid concrete, however, it is well worth avoiding a plywood floor over the most part of the area of the studio. If [illegible] the [illegible] paper [illegible] which has fitted carpet, a [illegible] plywood floor [illegible] The paper [illegible] works [illegible] well enough.

John de Visser

Creative approach

Reflections

Reflections can lend sparkle and surprise to otherwise ordinary pictures or may even be treated as the main subject of a composition

Reflections have always held a special fascination for photographers and it is not hard to see why. They are almost everywhere in nature and in the modern world. They possess a particular and unusual beauty and present a view of the world around us particularly from the viewpoint to be isolated and abstract. Apart from the photographing reflections needs no special equipment or technique – the secret of success lies mainly in the photographer's perception.

The starting point for taking pictures of reflected images, therefore, comes from recognizing what exists to see them. You only have to look through this way and be quite as simple and precise as we are almost taught to think reflections in daily life. We look through transparent materials or concentrate on the image of opaque reflective materials. Internal reflections at their surfaces – but they are not by [illegible]. Even in that property reflections are usually ignored because of their confusing effect on the subject image and many photographers fit filters to their camera to help eliminate or reduce them. Never pause to consider the potential of reflections as subject material in their own right.

Different types of reflective materials such as mirrors, glass, shiny metals and water produce different types of reflected images. But the quality of the light is just as important a factor as the reflective material used. Good clear light results in reflections of a similar nature. And as the lighting changes so too will the appearance of the reflected image. This is well worth bearing in mind as you may be able to get several quite different shots of the same subject by waiting for the lighting conditions to change or varying them deliberately.

Mirrors are perhaps the most obvious source of reflections and an ordinary domestic mirror provides a convenient starting point for practice.

Remember that the real distance between camera and subject is halved by a mirror and at wide aperture settings you will need to [illegible] the reflected image on the surface of the mirror if you want the reflection to appear sharp. However, [illegible] pictures and focus it with the mirror surround is sharp, but the reflection is slightly out of focus giving it a distinct impressionistic quality to the subject. With a narrow aperture it is possible to ensure that both the mirror and the reflection are in sharp focus. [illegible] the possibility of [illegible] the viewer [illegible] real life. Perhaps the best way to begin is to experiment with all these possibilities until you decide which you prefer to concentrate on.

Mirrors by their nature form a [illegible] image and are usually used for portraiture [illegible] [illegible] and [illegible] the [illegible] of [illegible]

Michael Freeman

Tower blocks *Glass clad buildings make good reflective surfaces. Here a wide angle transforms verticals into curves*

Boat *The brightest reflections show up when the reflecting surface is in shadow and the subject is strongly lit*

Nightclub *A display poster in a window seems to be superimposed on neon signs reflected from the streets*

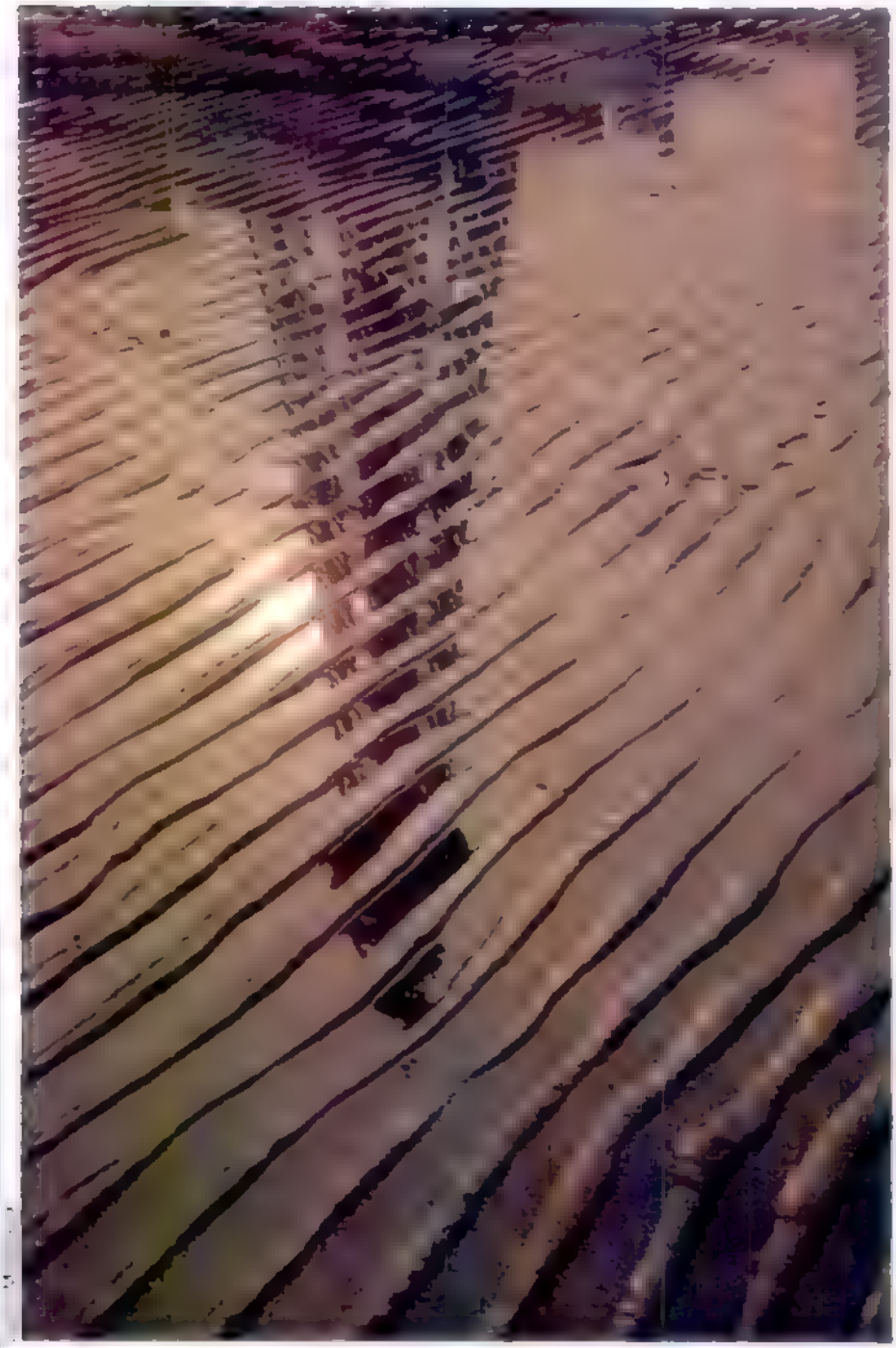
Alfred Bagley

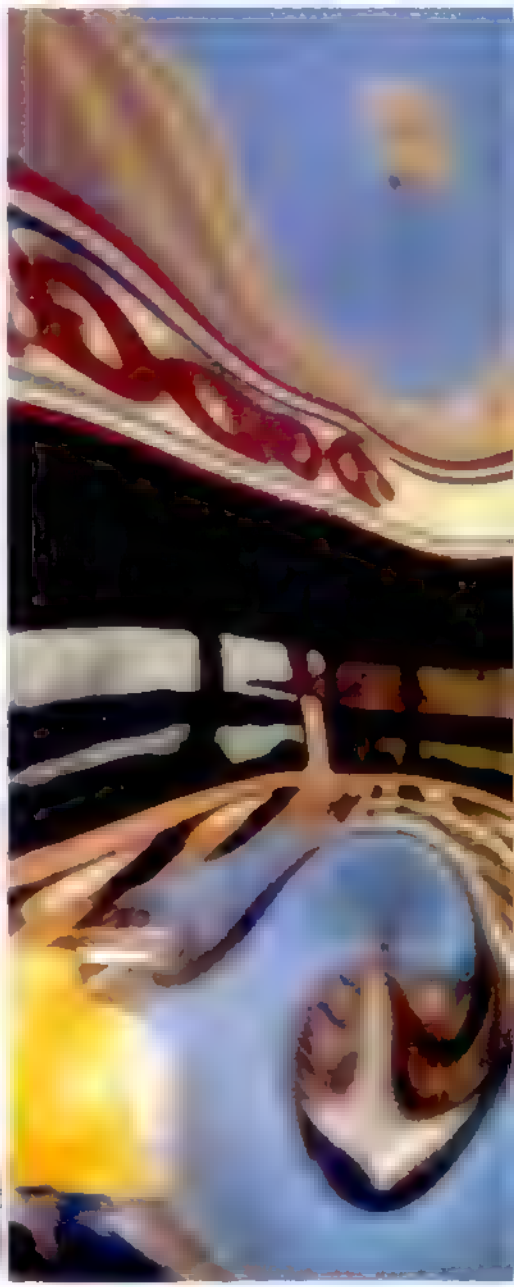
are involved as these produce distorted images. Most car hub caps, for instance, are convex and create ultra-wide angle [illegible] ar to the effect given by [illegible] This type of reflection can [illegible] a new slant to a much photograp[illegible] ubject—a famous building for instar[illegible] Smaller objects, such as polished steel salt cellars, knives and ornaments also give interesting reflections and, with some thought, can be worked into many compositions.

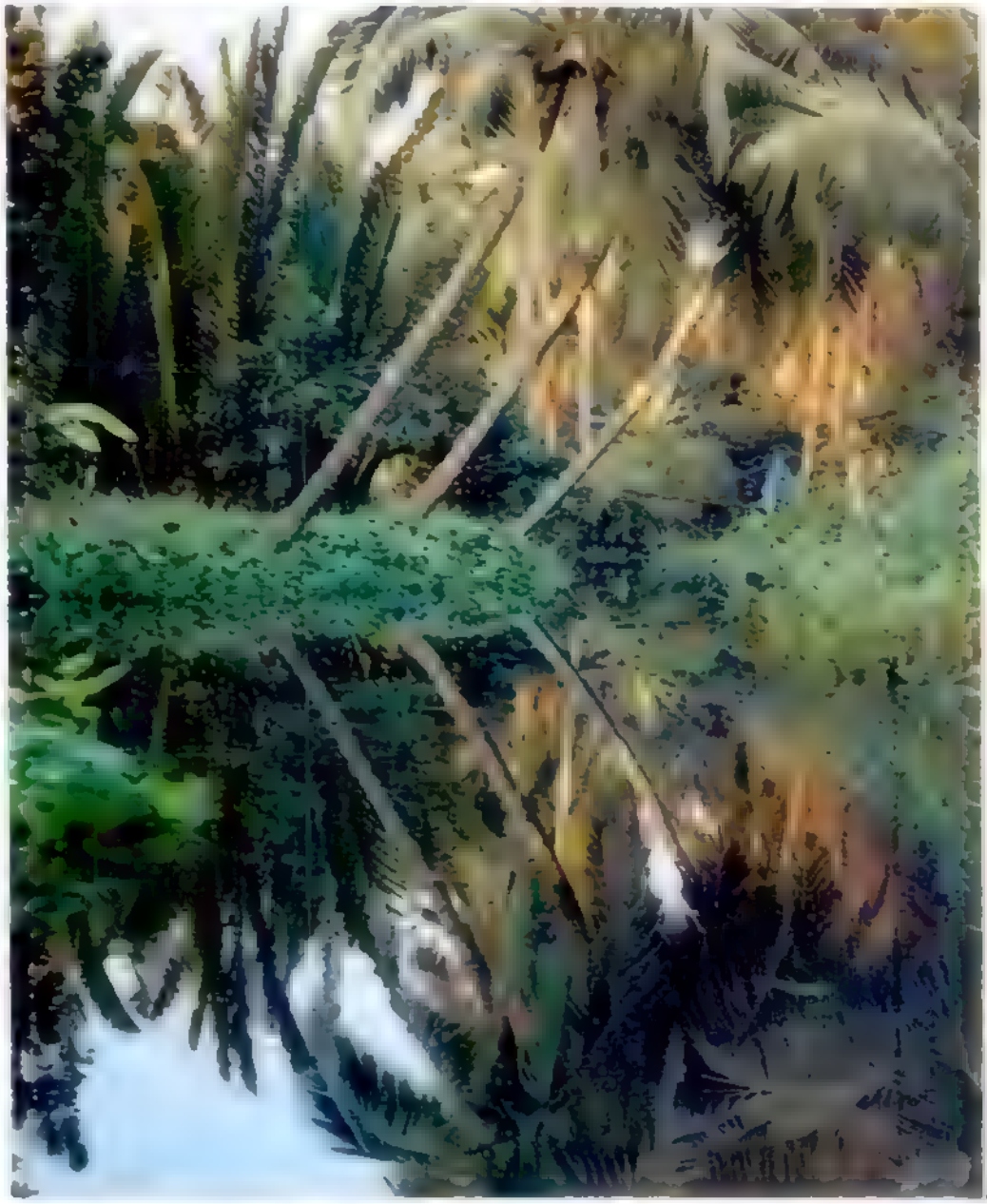
If you want to show accurate colour in a reflection from metal, choose silver coloured metals. Reflections from coloured metals such as copper and brass are less distinct and more difficult to pick out in the final picture, but may [illegible]

By focusing on one instrument you can catch the reflections of other players. Copper saucepans and brass tabletops sometimes found in bars can be used [illegible] reflect their surroundings. Since the reflections in these cases will not be very clear, you should try to render the subject as just a part of a wider, carefully thought out, composition. Whatever the metal, you will be more successful if it is clean, and if the subject of the reflection is adequately lit.

Glass, because of its transparent quality, allows partial as well as total reflection, depending on the direction of the light source and your own viewpoint. You may be able to see a misty reflection of something on the surface of the glass and yet still see through clearly enough to a subject behind it. Pictures of an exciting multi-dimensional







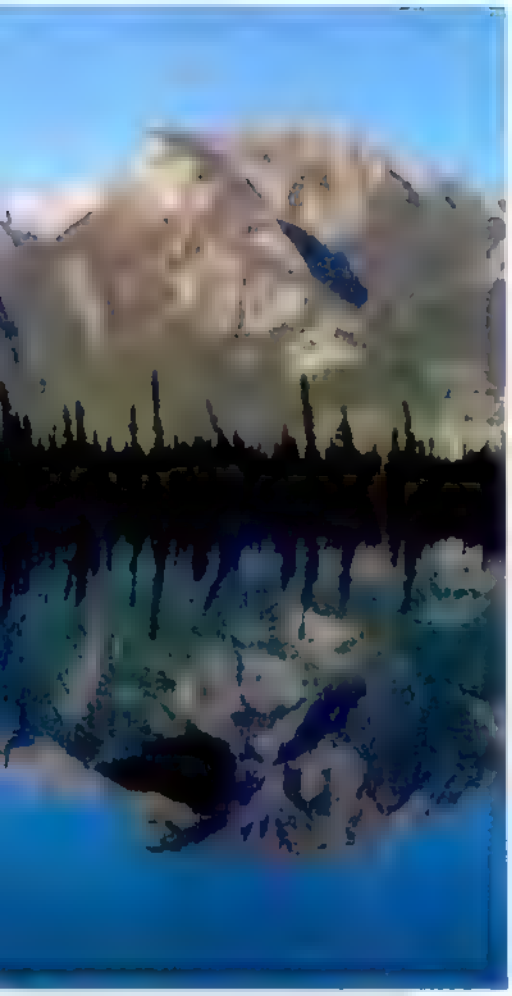
Seashore *Even a thin film of water is enough to give a reflected image which, in this shot, is broken up by patterns in the sand.*
Fairground *Curved metal surfaces, such as car bodies, produce vivid, clear but distorted reflections which make excellent pictures.*
Front foor *Small panels of convex glass reveal tiny individual wide angle reflections of a scene.*
Sunset *Careful positioning of the car, combined with an accurate exposure, shows a sunset with a difference.*
Palms *Giving equal weight to the subject and its reflection, keeps the image symmetrical. Here, the touch of blue adds an accent of colour*

John de Visser

Rocky Mountains *The still waters of a lake produce a mirror image which can transform an ordinary mountainscape*

Actor *Mirrors are obvious sources of reflections, so try to find subjects which are colourful and interesting*

Robert Macfarlane Susan Griggs Agency



Ripples *Water that is slightly disturbed produces impressionistic, and sometimes abstract, reflections*

Cake shop *In order to show this type of reflection clearly you need good light on both sides of the glass*

Understanding...

Lens sharpness

Assessments of lens quality tend to be rather vague. But there are aspects of lens performance which can be studied objectively by means of various tests

Sidney Ray

Photographers often talk about a particular lens as being good or not. But defining exactly what these terms mean is not easy. Opinions about a specific item often differ. So it is useful to be able to identify aspects which can be studied objectively.

Important terms involved when discussing lens quality are *resolution* and *definition*. The actual means of testing are dealt with in subsequent articles. But first [illegible] exactly what is meant by them.

Lens performance

Early astronomers tested new telescope lenses by looking at known double stars to see if both were visible as separate points – that is, if they were *resolved*. A lens with good resolving power, then, is one which is capable of showing fine detail clearly. Many people regard good resolving power as being the primary requirement of a lens. And [illegible]

graphers test their lenses for resolving power by using a special test chart and slow film. The chart consists of groups of black lines on a white ground, the spaces between the lines being equal in width to the lines themselves.

A lens is judged by how many lines per millimetre it can resolve. For this reason, the test charts contain lines of various separations. The film used when making lens tests should have a performance which is better than that of the lens itself, or the results will not be meaningful.

At the limit of a lens's performance, some deterioration in quality is inevitable. Oddly enough, the various criteria of performance do not go hand in hand. A lens with good resolving power will not necessarily give an image that looks critically sharp. Even a picture which shows excellent reproduction of fine details may not have the 'crisp' appearance nor

Soft focus *Some lenses are deliberately made 'soft' in order to produce special pictorial effects*

Pincushion distortion *Even a sharp lens may suffer from distortion, which makes it unsuitable for some subjects*

Sidney Ray

Television image *This is a case of the image looking 'sharp' but having poor resolution of detail*

mally associated with sharpness. It is equally possible for a photograph to appear very sharp when the reproduction of detail is actually very coarse. A good example of the latter is a correctly adjusted television set showing a studio transmission. The image may look crisply sharp, but its resolving power is very poor.

There is a problem in that the term 'sharpness' does not have a fixed meaning. Different people use it in different ways. But there is one aspect, concerned with contrast, which is largely responsible for producing sharp looking images.

It is possible to use a lens test chart to illustrate this aspect of sharpness. A lens with good resolving power shows the lines of the chart as separate lines in the image. But the edges of the lines may not be particularly clear. Instead of a distinct border between the black line and the white space, the image consists of an area where one fades into the other.

With an image which is 'sharp', however, the contrast between the lines and spaces is more abrupt—the edges of the lines are more clearly defined. However, some lines merge into others, giving lower resolution.

Sharpness is largely subjective. But it can be represented in terms of *acutance*. Measuring this involves plotting a graph showing density against distance for a 'knife-edge', which is reproduced on the film. This is a highly technical procedure. But a good indication of sharpness can be gained by applying a similar principle to the image of a line from a test chart.

Values are plotted for the black line, the white space, and points in between. The resulting graph will include a slope showing the gradual fall-off in density at the edge of the line. This slope can be represented by its gradient, which is known as the *edge gradient*. The steeper the gradient, the sharper the image appears. This result shows the sharpness of the lens–film combination. To study the sharpness of the lens alone it is necessary to examine the actual image projected by it. This is not usually done because the results would not be particularly informative. As with other aspects of lens quality, it is how the lens performs under normal conditions of use which is important. The type of film and method of development contribute significantly to the impression of sharpness since they can affect the contrast of the resulting photograph.

Definition

Another term, often used instead of sharpness, is *definition*. To be more precise, this usually means the combination of sharpness and resolution. A lens which can resolve reasonably fine detail and give good edge sharpness is said to have good definition.

With most lenses, sharpness and good resolving power go together. But the lens designer may decide to favour one of them. In addition, some lenses give better resolution with low contrast subjects, and some with high contrast ones. So these aspects of lens performance help to give a lens its individual characteristics.

The limits to resolving power and sharpness are often set by the residual aberrations of the lens (see page 906), so that stopping down can give better results. Lenses are classed as *aberration limited* or, if they are almost free of aberrations, *diffraction limited*.

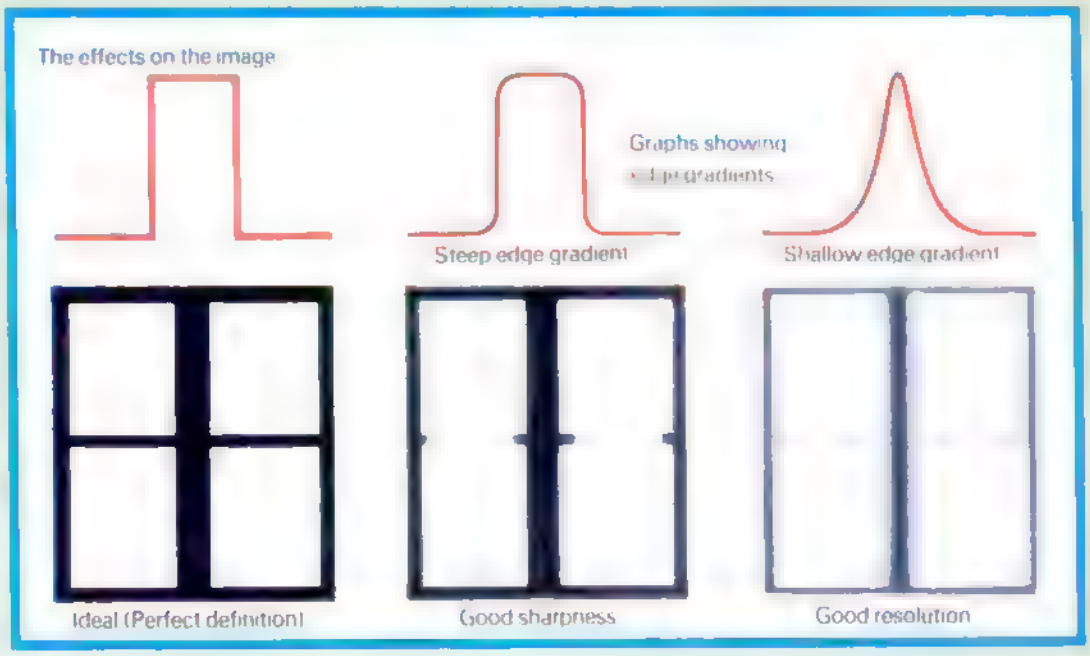
With a diffraction limited lens, the best definition is at full aperture, when the effects of diffraction (which produces progressively unsharp images as the lens is stopped down) are at a minimum. But with an aberration limited lens, definition is better with the lens stopped down slightly, to reduce spherical and chromatic aberrations. Furthermore the resolution tends to deteriorate towards the edges of the field. Stopping down helps in this respect.

If the lens is stopped down too far, so that the light passes through a rather small aperture, diffraction cancels out the benefit gained by having less spherical and chromatic aberrations. There is an optimum aperture which produces the best compromise. But this may not be the same for the edges of the field as for the centre. So for the best overall result, the lens is stopped down slightly further—say another half stop—to improve the detail at the edge of the frame.

Even if the lens is free from those aberrations which affect definition, it may suffer from distortion. Such a lens can produce images which are very sharp and full of fine detail. But its use is restricted because it tends to distort straight lines.

At the other extreme, some portrait lenses deliberately sacrifice definition in order to produce a soft focus effect. They do this by not correcting for some of the spherical aberration produced by the basic lens design. Both these examples show that sharpness and resolution are not necessarily the only criteria for judging a lens. The quality or value of a lens can only be determined by looking at what it is needed for and how it is likely to be used.

Sharpness and resolution ***Fine detail (represented by lines on a test chart) can be affected in different ways by a lens. It can have clearly visible edges—good edge sharpness—without the separate details being resolved. Or, all the details may be resolved without the image looking very sharp***



Advertising Arts

Push processing B&W

The speed of your film is often a severe restriction on your picture taking capabilities. But you can push film speed either by increasing development times or by using special developers

Barry Lewis, Network

***Way out landscape** For something just a little out of the ordinary, try push processing films used in full daylight*

The problem is a common one: you look through the viewfinder of your camera and find that, even with your lens aperture wide open, you cannot select a shutter speed fast enough for a hand held photograph. There simply is not enough light.

There are many solutions to the problem, most of which call for extra equipment and have attendant disadvantages. You can add extra light with a flashgun—and quite possibly destroy the visual mood that you want to capture. You can fit a faster lens [illegible] one. You can put your camera on a tripod and hope that your subject [illegible]. Or you can use a faster film [illegible] you are not already using the fastest film you can find.

The last course is [illegible] the best since it calls for no extra bulky equipment, yet leaves you mobile and relatively inconspicuous. For this reason [illegible] ISO [illegible] and while [illegible] standard by most press photographers and others who want to take [illegible] pictures in poor or adverse lighting [illegible]

[illegible] 400 ASA film, there is still one more thing that can be done: you can increase the ASA number of the film and compensate later by changing the development [illegible]

Pushing

When film is given different development to increase [illegible] speed that is known as [illegible] or more simply, pushing, [illegible] taking photographs in poor light pushing has some disadvantages but quite often these are [illegible]

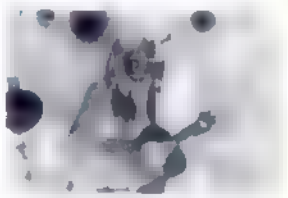
There is a [illegible] speed and ASA numbers. They are [illegible] films under certain standardized circumstances. The ASA numbers of black and white films are established by the makers who process test rolls in a standard developer and compare the results with a standard series of [illegible] that have been found to give prints that are acceptable to most people. This system has certain disadvantages. In the first place, many people do not actually use the [illegible] developer for normal photography. And in the second place, the picture quality that others may find acceptable may not be quite what you want for your photographs. By taking advantage of the different types of developer that are available, and by carefully deciding at what level to 'peg' the quality of your photographs, you may find that you can exploit your film and work from it [illegible] ASA numbers.

Generally, however, pushed film has certain disadvantages. The very best results [illegible] only by using the slowest film possible and this must be developed correctly after exposure. Faster films are [illegible] developer and [illegible] and pushing [illegible] in theory, the process has [illegible] that the other [illegible] points

Exposed at 400 ASA

BEST WORST NEG

A complete length of Ilford HP5 film was exposed at a nominal rating of 400 ASA and sections of this were developed in different developers or for different times. Development time in ID-11 diluted 1 + 1 is normally 12 minutes. But for this shot, 18 minutes proved better. The neg (top) has more contrast than with normal development. The densest negative (Paterson Acuspeed, lower) is acceptable



12 → 12A

37 → 37A

Exposed at 1600 ASA

BEST WORST NEG

Another roll of HP5 was exposed at 1600 ASA and sections of this were processed in ordinary and speed increasing developers. The most satisfactory print was obtained from film developed in Baumann Diafine (top) although comparable quality was obtained by using Paterson Acuspeed. About the only really unprintable negative (lower) came from film which received the ordinary 12 minute ID-11 (1 + 1) development

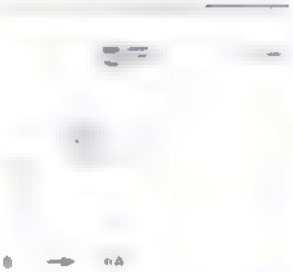
17 → 17A

Exposed at 6400 ASA

BEST WORST NEG

This is a really testing lighting situation where available light photography poses immense difficulties. HP5 was exposed at a nominal rating of 6400 ASA. Baumann Acufine yielded by far the best negative (top) in the printing used for these tests. Images from Paterson Acuspeed (normal time) and diluted ID-11 push processed for 24 minutes could be of some use, but negatives are very thin and require careful printing

23A



6 → 6A

XP1 and HP5 compared

XP1 exposed at 400 ASA

HP5 processed in ID 11 for 12 mins

XP1 exposed at 1600 ASA

HP5 processed in ID-11 for 24 mins.

XP1 exposed at 6400 ASA

HP5 processed in Acuspeed

Clay Perry

To compare the performance of Ilford XP1 and pushed HP5 we took these three pairs of pictures. For each pair both films were given the same exposure, but while the process time for the HP5 was extended to suit the rate at which it was exposed all the XP1 was given the standard 1600 ASA time. At 400 ASA, XP1 gives good contrast but mushy grain, at 1600 ASA it gives slightly better highlight detail than HP5, at 6400 ASA, however — in very low light—XP1 is much weaker

and smaller apertures not linked with a rated film enables you to take pictures which appear to be sharper but the significant disadvantage of pushing is that shadow detail is reduced. This gives pictures with far more of empty dark tone where in the original you may have been able to see detail.

Extended development

The easiest way to extract more speed from black and white film is simply to develop it for longer. Although this has the effect of increasing the image contrast of the negatives it does not normally pose too many difficulties at the printing stage, providing you avoid very long development times. When printing an underexposed but normally developed negative many photographers encounter two problems. First the negative is very thin and needs very short printing exposures. Second it is usually difficult to make the deepest shadows print as dark tones without affecting the tonal balance of the important tones in the picture. A remedy is to print on a harder than normal grade of paper. This can be expensive if you have to buy a box of paper for just a few or two — and there is always the possibility that a hard enough grade for your needs does not exist or is not readily available. But increasing negative contrast by extending development times enables you to print underexposed negatives with good dark tones on normal grades of paper.

Increased development also results in much greater granularity and loss of highlight detail due to higher contrast and a third problem—loss of film speed. Just because a pushed negative looks as if it has about the same overall density as a normally exposed and developed negative this does not mean that it actually has as much printable photographic information recorded on it. When film is left in developer long enough even the unexposed silver halides in the film emulsion begin to be developed. This produces what is called *development fog* in the shadow areas.

Fog can mislead you into thinking that you have recorded more detail than is the case as well as being bad for your pictures. The main problem with pushing film is preserving the separation of tones corresponding to the shadow detail of the object. Lengthy development can cause such an increase in the fog level that the fog literally swamps the slight tonal separations that you are most anxious to keep. But as long as the development is not pushed too much the gain in contrast will more than offset the fog effect and details will be visible in the shadow areas.

So development time cannot be extended indefinitely to give higher film speeds. However extended development is a simple easy technique and is worth using when you only need a moderate increase in speed. The degree of extra development needed depends on the film and developer you customarily use. As a guide if you double your film speed you need to give 50 per cent extra development. Thus a 400 ASA film that normally requires eight minutes development should be given 12 minutes development if it is exposed at a rating of 800 ASA.

Special developers

If you often have the need to rate your film at higher than its specified ASA rating, then you should investigate the potential of specialist [illegible] in increasing developers. These are usually compensating type developers which work less strongly on the heavily exposed highlights of the negative than on the shadow areas. The result is that they give shadow detail lift without unduly affecting highlight tones. Because of this compensating development [illegible] when you are photographing [illegible] that are lacking detail intensity [illegible] they improve shadow detail they also retain the separation of highlight tones that are lost after pushing development in normal developers.

Many developers are [illegible] that claim to produce an increase in film speed. Acuspeed, Diafine, Microphen, and many others all have their supporters. Most are [illegible] the same way as normal developers which provide little or no speed increase but some such as Diafine and Microphen are particularly interesting since they are two-bath developers offering very high film speed ratings.

In these the [illegible] of the developer are divided [illegible] The first solution contains a low working developing agent. The second solution contains an alkali.

When film is immersed in the first solution very little happens. After the film has had long enough to absorb sufficient developing agent into the emulsion, the film is removed and placed in the second solution. The alkali in the second solution [illegible]

solution is poured in. The activator immediately makes the developing agent start to work

The first solution is formulated in such a way that the concentration of developing agent soaked into the emulsion is just sufficient to develop the negative highlights So when the activator comes into contact with the film, the developer in the highlights—the dense, fully exposed parts of the image of a negative—is quickly exhausted whereas development continues in the shadow areas. The result is a considerable boost in the effective film speed and a reduction in contrast

In addition, two-bath developers are particularly easy to use since the degree of development they give to film is governed primarily by the concentration of the first solution rather than by time or temperature. As long as the temperature and time are approximately correct the film will be properly developed.

Chromogenic films

Although very high speed films have been available for some time, these have in the past been very grainy conventional type films such as Kodak 2475 Recording film and Kodak Royal-X These can be processed in much the same way as ordinary high speed films

Lately, however, the new chromogenic films such as Ilford XP1 and Agfa Vario-XL have become popular with photographers seeking more speed Their manufacturers claim that these films give satisfactory results at any speed rating from 125 to 1600 ASA

With such a considerable reserve of speed, there is little point in push processing the film, and Agfa give no recommendations for pushing Vario-XL Ilford, on the other hand, do give extended processing recommendations for use when their XP1 film has been exposed at 800 ASA or 1600 ASA. At its standard processing temperature of 38°C, XP1 should be developed for 8½ minutes at 800 ASA or for 9 minutes at 1600 ASA.

This has advantages, since it enables an image to be produced that can be more easily printed, but it is not without its disadvantages XP1 is designed to give optimum results at 400 ASA, at which speed it behaves like a very sharp, fine grain film with unusually high speed The emphasis of XP1 is on image quality rather than speed, and pushing this film tends to defeat its designed purpose For this reason, Ilford suggest that for maximum speed you should use their conventional HP5 film developed in Microphen

There is no recommended method for pushing Vario-XL However, if you wish to experiment with increased development of this film, try giving a five minute development time instead of the recommended 3½ minute time in C41 chemicals This should give about a one stop increase in film speed

Making your own tests

If you intend to do a great deal of low light photography, it will be worthwhile making a series of tests to establish an accurate set of times for push processing, even if so-called speed increasing developers are used. These tests are straightforward, but you must take all the usual precautions to make sure that the processing conditions remain identical if results are always going to hold true

The tests involve photographing the same subject at a range of exposures corresponding to different film speeds This is done on several strips of film, which are then push processed at different times

Choose an even-toned subject such as a specially arranged still life or test target, and make exposures corresponding to a range of different ASA values For 400 ASA film, start with a 200 ASA exposure, and progressively double this on each subsequent exposure so a range of, say, up to 6400 ASA is covered Take careful note of your sequence of exposures so a particular ASA rating can easily be traced after processing. The ideal way to do this is to include a note of the rated speed in each frame

Your camera meter may not operate at the higher end of the ASA speeds range, but it is a simple matter to continue halving the exposure once the limit is reached

Repeat the series of exposures several times so you have enough strips of film for testing a range of development times, but these have to be 'split'—in darkness—before processing. You should be able to get at least two tests on each film so you have enough strips for testing a range of development times.

If you are being really thorough, the range of times should start with the development time you use for the normal 400 ASA rating—you can use this test to check whether your equipment, technique and methods of photography match the 'normal' rating. A better quality image at other than the 400 ASA exposure would suggest otherwise

You can then use the remaining strips to gauge the effects of increasing the development time beyond the normal If the film or developer maker gives suggestions for push processing, use these as a basis for your own experiments Otherwise, set yourself a range of increases—say, an extra 25 per cent, 50 per cent, 75 per cent, 100 per cent, and so on—and progressively work through these until it is clear that the resulting quality of the image is no longer of use to you.

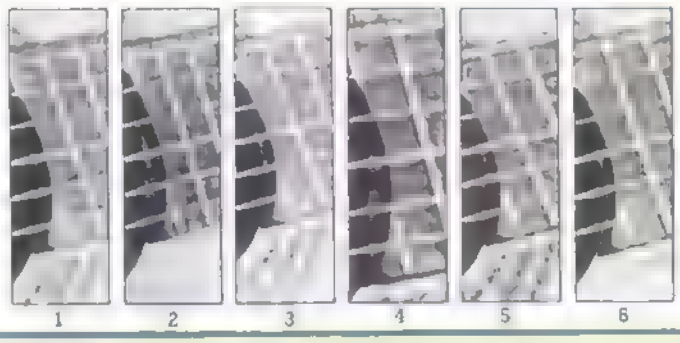
The test sequence can be repeated for any other film and developer combination but there is little point trying to push process films slower than 400 ASA for anything other than a rescue operation of a whole film length known to be underexposed.

If speed-increasing developers are push processed much beyond their 'normal' development times, you risk a rapid build up in the fog level. Nevertheless, you may find it an interesting experiment to conduct a test sequence using these special developers. The range of effective ASA values could then be increased considerably beyond the 6400 ASA mark used for standard type developers, but you will notice a rapid fall off in quality before these levels are reached.

You can establish which is the most effective ASA rating for a particular development time effectively only by printing your images. The ASA value which yields the most satisfactory print image can be checked from your notes.

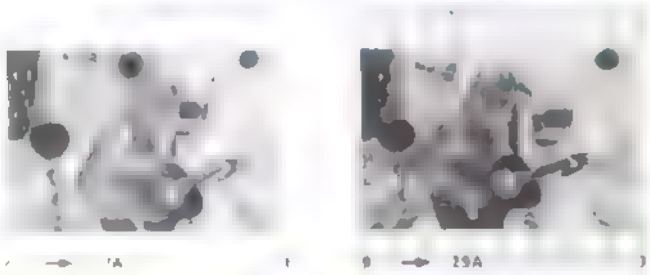
How grain size increases

Fog level goes up with film speed as well as grain size. HP5 has much less fog when processed normally (right) than when push processed (far right)



Fog level changes

Sections of × 12 prints from HP5 exposed at 400 ASA and developed thus:
1 *ID-11 (1 + 1): 12 mins.* **2** *18 mins.*
3 *24 mins.*
4 *Acuspeed.*
5 *Diafine.*
6 *XP1 processed for 1600 ASA*



Jean-Paul Ferrero

One of the youngest wildlife photographers working today to have achieved a worldwide reputation, Jean-Paul Ferrero travels the globe photographing the subjects he loves best

Jean-Paul Ferrero *will sit for hours on end in hides in order to achieve the best results possible*

to take the pictures. Then having selected their chosen tree they would have positioned themselves with their cameras well clear of the tree trunk.

It is the extra element that makes Ferrero's approach to his art. He has gone to the lengths of having a large unwieldy tripod into the tree with him

Freedom of the range *Thoroughbred horses photographed late one afternoon in western New South Wales, Australia*

Kangaroos *Picked out by the sunlight this group of red kangaroos were photographed during a six month project*

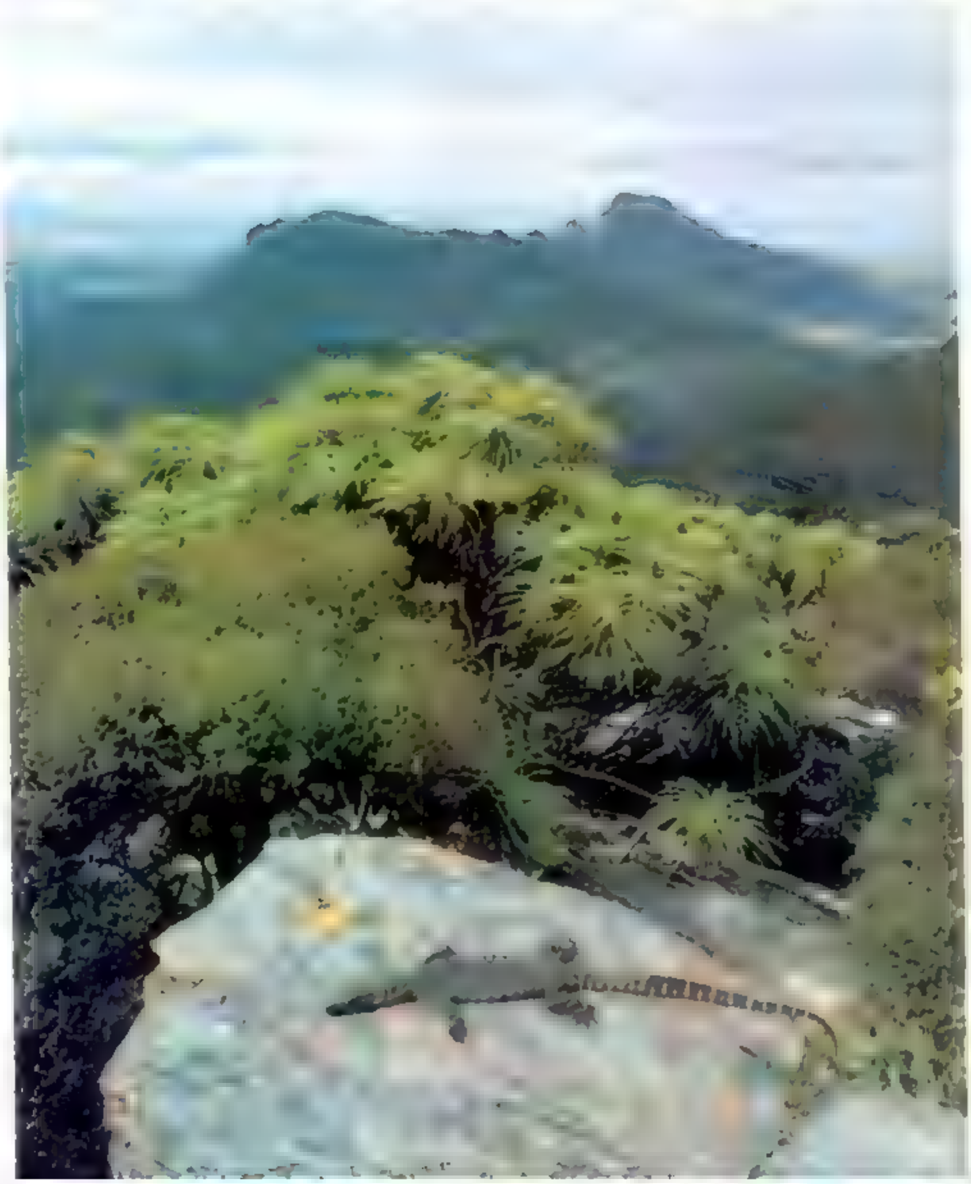
[illegible] wanted to study animals in the field [illegible] the short way to [illegible] was to take pictures [illegible]

He began by photographing [illegible] and some of his pictures to magazines and then left his native [illegible] for Australia where he [illegible] around for three months with very little equipment and [illegible]

His reasons for choosing Australia for his first self-assigned project are very [illegible] and were strongly influenced by [illegible] wildlife photographers [illegible] great depth [illegible] South America or Australia [illegible] Australian [illegible] interested [illegible] thinking about the country [illegible] wildlife [illegible]

Recently [illegible] interest has increased and he is now planning to [illegible] his other [illegible] in Australia, New Guinea and New Zealand.

Personal motivation is [illegible]



Varanus rosenbergi *A rare lizard taken on Bluff Knoll in the middle of the Stirling Ranges in Australia*

strated by the six months he spent in Australia exclusively photographing kangaroos. 'If you want to do something well then you have to spend your whole time on it . . . you have to do it and not think about anything else. When I photographed kangaroos, I intended to have the best pictures of them ever taken. I think I succeeded. It took me a lot of time but it was worth it. That's the only way you get recognized and get work. If you do bits and pieces of everything it's just a waste of time in terms of business and a job.'

It is not always possible for Ferrero to find the financial backing for his long-term projects. Instead, he manages to earn a living by doing shorter assignments. After working for a number of French magazines he started doing [illegible]nments for *GEO* in the late 70s. [illegible]e ranged from a news story on the reintroduction of the barbary ape [illegible] Morocco to more extended essays [illegible] the one he recently did on horses covering the stud farms of France.

Like many other professional photographers he is keen to point out how little of his time is actually spent on the assignment itself. 'I only spend about 50 per cent of my time actually taking pictures. The other half will be spent making notes, captions, looking through my files, sending invoices and on administrative work generally. I would love to get rid of all that stuff—I would love to spend 24 hours a day taking pictures of wildlife, but it's just not possible. I have to pay t[illegible]'

Ferrero's projects and assignments also help to build up his picture library from which he now earns around 40 per cent of his income. He operates the library jointly with his agents in Paris and London. 'Basically, I'd like to get more interesting assignments and to get rid of my library completely to my agents but that's a big step to take.'

Although much of his work displays exemplary use of light, movement and composition, Ferrero is reluctant to admit to having a particular style: 'It's [illegible] a different subject. I have one way to photograph it and I just don't care what has been done before. I think the light and the way I feel at that moment command the way I work.' He is concerned to 'take pictures that show very well what must be shown and what I think should be included in the picture.'

He recognizes that his work is constantly and subtly developing and changing. 'I'm much more involved in movement now and in showing animals in their environment, like the picture of the lizard which I saw on a rock at the top of Bluff Knoll in Western Australia. That species was only named two years ago. Before that it was considered to be a subspecies. This is one of the first pictures ever taken of it in the wild.'

In the pursuit of his subjects Ferrero has also found that it is not only planning, research, and immense patience that are essential. He also has to learn to deal with some of the endless problems that beset any photographer who works far from the resources of so-called 'civilization' and often in dangerous situations. Vehicles may break down in the middle of deserts and once while waiting to [illegible] in rain forest and got [illegible] I with leeches.

To get his pictures, Ferrero travels with a lot of photographic equipment. He goes prepared for any eventuality. 'When you rely on taking pictures to make your living, you can't afford to take any chances. I really hate to be in a situation where through lack of equipment I can't take the picture I want to take.' As a result he ends up travelling with four cases of equipment weighing over thirty kilos in all.

These contain F2 and FE Niko[illegible] as well as a special motor-driven [illegible] which takes up to ten frames per second.

Stud farm in France *(left) photographed for GEO, and the rare* **Siberian crane** *(below) in Bharatpur, India*

Shepherding the flock *A perfectly framed picture of a group of sheep taken in rural France*

He also carries a wide range of lenses: 18, 24, 105, 150, 155 macro, 180, 400 and 500 mm. In addition he carries a medium-format outfit—a Mamiya 6 × 7 with 37, 50, 90, 180 and 360 mm lenses.

When taking light readings Ferrero prefers a hand meter. 'I don't really lik[illegible] the automatic TTL meters. You get so many problems with batteries—you just can't rely on them.' Instead, he uses a Pentax Spotmeter with a one-degree angle of acceptance. 'It's very good, but it was hard for me at the beginning because you don't know what you' [illegible] measuring. You can make mistakes so easily, but once you know how to use it you get beautiful exposures. I'm beginning to know about different lighting conditions now—I've got a spotmeter in my eye.'

Ferrero also travels with two Norman flash units and a Linhof tripod which he values greatly, after being let down in the field by other well known and highly respected brand-name tripods. However he uses little other special equipment. 'My basic filter is a polarizer and that's it, although I may sometimes use correction filters if I have a particular film in my camera.'

Black and white film holds little attraction. Ferrero works almost exclusively in colour. 'I prefer Kodachrome for sharpness but not so much for the colour rendition. It's harder and harder to get a good green. For colour rendition I prefer Ektachrome 64.'

Processing faults have also plagued Ferrero from time to time. 'I've had a lot of problems with scratches and colour shifts in my film. On a roll of 36 exposures I will only take 12 usable pictures as I take each photograph three times. I've

Jean-Paul Ferrero/Ardea Photographics

Thorny devil *A strange feature of the harsh deserts that cover most of Central Australia*

Sea cliffs *The majesty of these cliffs on the Great Australian Bight are emphasized by the shafts of sunlight*

Jean Paul Ferrero Ardea Photographics

Creative approach

Still life

Still lifes can show the photographer at his most creative—even the most mundane things can be subjects and it is the photographer's skill in identifying and arranging them that is the key to success

Howard Kings North

Black and blue *An unusual viewpoint on an object as mundane as a coffee cup—its texture echoed in the background creates a strong abstract design*

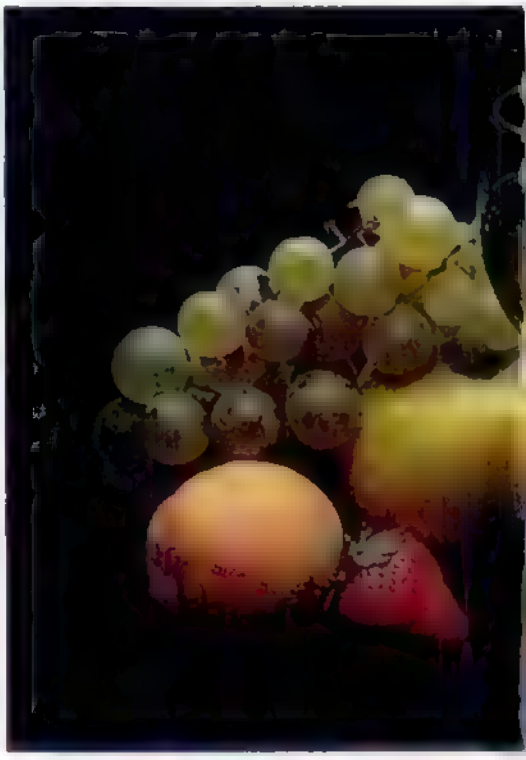
to the right of the coffee cup and a pair of opera glasses lying on an opera house programme beside the packet of cigarettes and slightly under them, then you have an example of a completely 'arranged' still life

If you consider this imaginary advertisement, it becomes clear that this is not a random selection of objects but that each has been carefully chosen to contribute towards a particular theme In this case, the theme could be described as one of elegance. The advertisers want their brand of cigarettes to have a glamorous image and have designed the photograph with this in mind. On closer inspection, you may notice that the lighting, in particular, contributes towards the mood of elegance. Directional lighting with pronounced shadows helps to suggest the end of a formal night out No detail in a still life should be overlooked when the success of the whole effect depends on all the elements mentioned combining to create a complete image—not simply a collection of mundane objects

A classic example of a still life which is a success for just this reason, is called *Theatre accident: the spilled handbag* taken by the American photographer Irving Penn. The colour photograph contains 18 separate objects, 16 of which have spilled out from a gold lame handbag that has dropped on the floor beside a foot in a black patent leather shoe in the corner of the shot The foot, the bag, and the objects that spill from it are looked down on by the camera above them. The miracle of this particular still life is that all these different things, apparently dropped and fallen out at random, fuse together into a whole that is totally effective Every object was selected to contrast with or complement the others by its material, its shape and its colour. The actual arrangement of each object that has 'fallen' from the bag leads the eye on a swift journey of satisfaction

The glory of still life photography is that it really does not require either sophisticated apparatus, a big studio set up, or professional lighting systems Nor does it require complex arrangements to be wholly satisfying or fully creative. A country loaf, a wooden bread board, a breadknife, a fat hunk of farmhouse cheese and an apple or two (one of them a windfall with a leaf or two attached to the stalk) could make a wonderful still life So could a bunch of

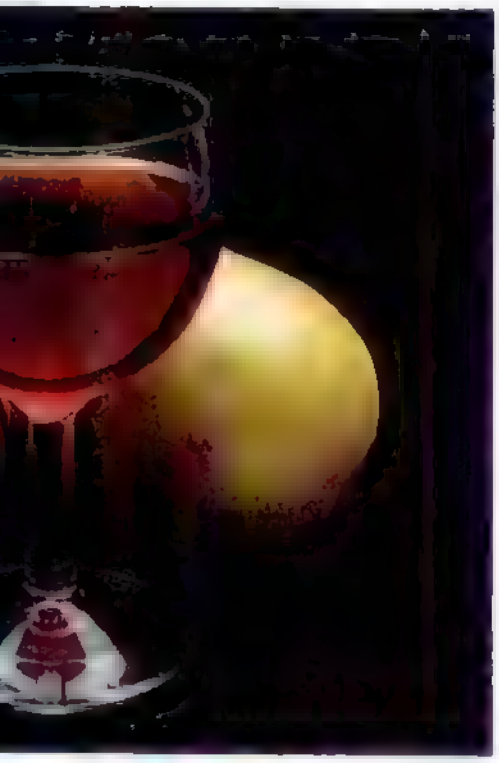
Virginia Woolf's desk *Carefully chosen and arranged artefacts evoke something of the writer and the way she worked.* **Pink cockerel** *Beaches are always good places to look for still lifes—here direct sunlight makes unpromising rubbish part of a strong composition.* **Vegetables** *A natural setting can set the tone for the subject.* **Tulips** *A sign of unfinished activity—an artist's crayons resting on the paper—enlivens a still life.* **Pencils** *Close in and look for colour, pattern and texture*



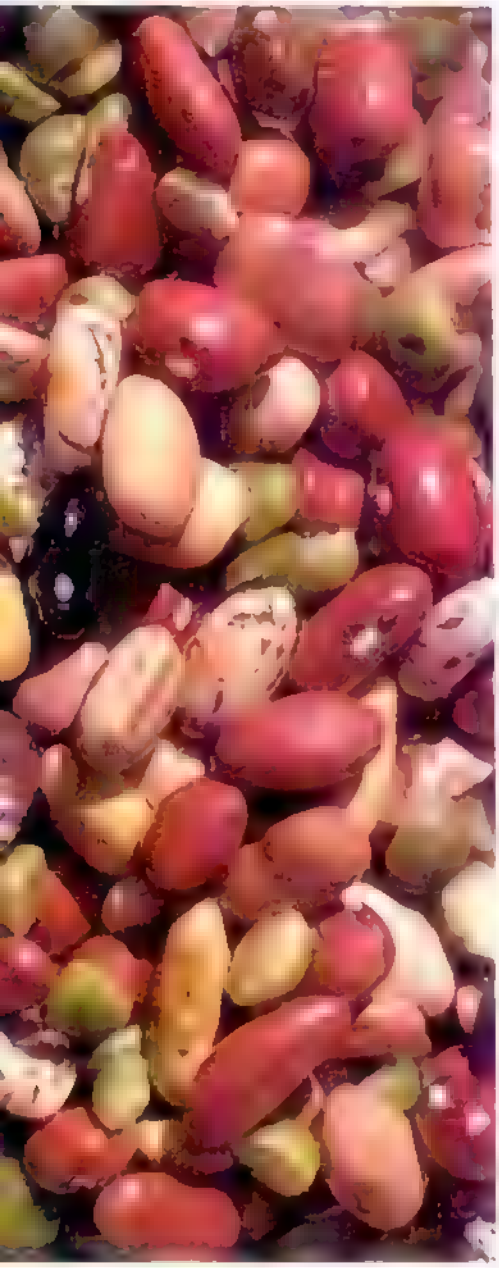
Anthony Blake

Robin Bath

The morning catch *A background of boats and soft morning light that brings out the subtle colours and textures creates an image of fish fresh from the sea* **Beans** *Even simple subjects need arranging to give a balanced pattern*



Wine and fruit *A classic still life delicate lighting and a dark background to highlight the subject cluster*



Mushroom picking *Still lifes often work best when they tell a story warm tones and backlighting help recreate a traditional summer's morning*

From colour to B&W

Many photographs have far more impact in black and white than they do in colour—why not try printing some of your colour negatives on to black and white paper to create an entirely new picture?

[illegible] photographers [illegible] colour films as a matter of [illegible] there are occasions when [illegible] would be more suitable [illegible] to record a scene in [illegible]

[illegible] solution to this would be [illegible] loaded with [illegible] expensive [illegible] Fortunately there is an [illegible] solution to the problem [illegible] make black [illegible] colour negatives [illegible] printing [illegible] slightly more [illegible] than be of [illegible] respects [illegible] from a normal [illegible] and white negative

[illegible] like a black and white print from a [illegible] negative, you can either print it [illegible] on normal bro[illegible] paper [illegible] negative. This [illegible] print, and although the [illegible] usually of the [illegible] be adequate [illegible] transparency [illegible] acceptable quality [illegible] contact printed on low speed fine grain panchromatic film.

Printing from colour negatives

You can print a colour negative on [illegible] bromide paper, [illegible] print [illegible] magenta and [illegible] that the tones in the print do not [illegible] to the tones in the original [illegible] things that were blue are [illegible] in tone while all other colours which do not reflect blue reproduce as very dark or even black.

In addition colour negatives are [illegible] coloured film [illegible] light strongly printing exposures tend to be very long.

While [illegible] paper is acceptable for [illegible] or making contact prints, for [illegible] you should use [illegible] paper—[illegible] Ilford RC—for [illegible] negatives. This paper gives [illegible] balanced tones in [illegible] and [illegible] results are similar to [illegible] from black and white [illegible]

[illegible] paper is sensitive to [illegible] should ideally [illegible] although you [illegible] a [illegible] amber safelight [illegible] 13) if you prefer.

[illegible] and no special [illegible] through devel- [illegible] between 1½ and [illegible] C [illegible] should use a [illegible] time. This is [illegible] the paper in [illegible] low level illumination and you cannot see the image appearing as you would in conventional black and white printing.

Set up your enlarger as normal and make an exposure test print in steps [illegible] exposure than a comparable enlargement in normal black and white printing. As a guide, 10 seconds at f/11 should be [illegible] for a 20 × [illegible] enlargement [illegible]

[illegible] should [illegible] from a [illegible] showing deep [illegible]

[illegible] you can use the properties of panchromatic paper to pro-

John Ward

Problem for B & W *Subtle differences in light colours, isolated patches of bright colour, and severe contrast make this hard to print in black and white*

Ordinary bromide *On ordinary bromide paper, even a good print from the colour negative looks flat but it is suitable for quick proof printing*

Panchromatic paper *Printing the same negative on Kodak Panalure II RC paper gives a better, more realistic separation of tones, and stronger blacks*

Using colour printing filters

One of the attractive features of making black and white prints from colour negatives is the degree of control you have over the tone recorded for each colour in the original scene—providing you print on panchromatic paper, such as Kodak Panalure II RC. If the tones in the black and white print are to correspond to their value in the original—that is, if the print is to look similar to one made from a normal black and white negative—you can make a straight print (below left). But just as you can use filters to alter the colour balance when printing in colour, you can use filters to alter the tone given by each colour in the black and white print. For the print below right, a yellow filter was used and the effect is similar to using a yellow filter over the lens when shooting in black and white. Anything blue in the original scene is darkened so that white clouds stand out against a dark sky. To lighten the tone recorded for a colour, print through filters of the same colour: to darken the tone, use filters in its complementary colour. The effect of filters is to alter the colour of the printing light and the results given by various coloured printing lights are shown in the colour patches reproduced below

Colour patches *Compare how filtration affects the reproduction of this colour scale on Kodak Panalure II*

Without filtration *White light printing without filtration gives the most satisfactory reproduction of the original*

Printing with yellow light *Yellow is lightened significantly but otherwise the black and white reproduction is very good*

Printing with blue light *All colours containing blue are lightened, other colours are unaffected*

Printing with magenta light *The scarlet magenta patch is lightened and yellow and red match purple and blue in tone*

Printing with green light *Brown, purple, scarlet and red are darkened to a point where they are almost black*

Printing with cyan light *Blue is lightened slightly but all other colours are darkened*

Printing with red light *Colours containing red light are lightened, yellow is unaffected, blues are darkened*

Using an interneg *The best way of making a good quality black and white print from a colour transparency is to produce an internegative on panchromatic film. Cut down excessive contrast by overexposing slightly and then underdeveloping. The best quality can be obtained by making an enlarged copy negative and contact printing it*

duce special printing e[illegible] sensitive to light o[illegible] ur filtration to con[illegible] in the print [illegible] ame, in practice, as that obtained by using filters when actually taking black and white photographs

To darken a colour in the image, make [illegible] posure through filtration of its [illegible] ntary colour So to darken a [illegible] insert a yellow correction [illegible] filter drawer befor[illegible] sure If your [illegible] our head, simply dial in the required [illegible] nt of filtration

[illegible] exact amount of fi[illegible] n the en[illegible] control to produce [illegible] ation of tones

John Ward

Printing from transparencies

[illegible] four differe[illegible] nd [illegible]

[illegible] paper [illegible]

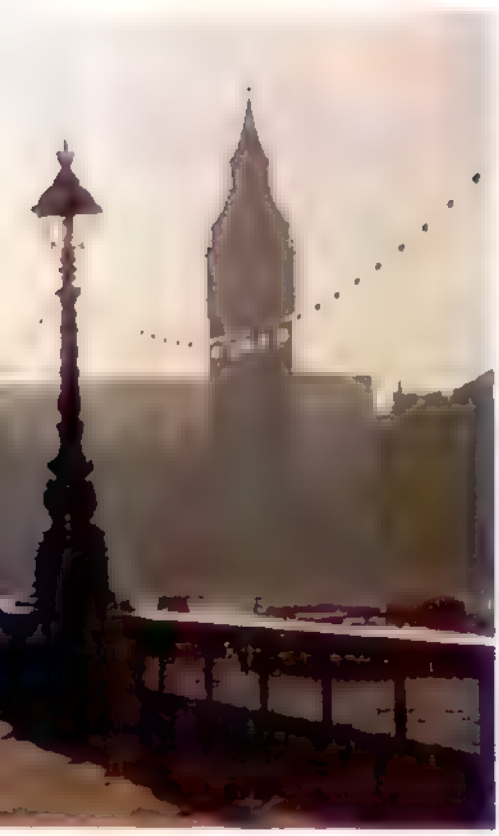
[illegible] sized copies by contact [illegible] table panchromatic film such [illegible] X or Ilford Pan F in [illegible] rolls If you have access to large-[illegible] eet film, you may prefer to make a [illegible] py enlargement by using your en-[illegible] r to print your transparency on this [illegible] l. The resulting print-sized nega-[illegible] on normal [illegible] and white [illegible]

[illegible] used, it is best [illegible] make a range of exposures so that you [illegible] elect the negative which has the [illegible] y for your purposes. If your [illegible] are correctly exposed and [illegible] rp in the first place, the [illegible] prints should be of good quality

If you want to make a colour negative from an original colour slide, proceed in [illegible] the same way, but print it on

Using an internegative

[illegible] ermediate [illegible] y on to black and wh[illegible] an SLR, ordin[illegible] pying attachment for th[illegible] scription of the [illegible] '26 to 729 [illegible] prefer to



Direct reversal *For quick proofing of colour transparencies you can use a direct reversal material such as Kodak Kodagraph Transtar. Not all subjects reproduce well—mottling may occur in large areas of one tone—and you may find that a 'straight' print (below left) is considerably improved either by localized exposure control, or by giving the print a separate flash exposure to white light (below right)*

Black and white reversal paper

This paper is orthochromatic—that

Basic lens testing

For a really sharp picture, a lens must be able to render the tiniest features of a subject clearly and a number of simple tests have been devised to establish just how much fine detail it can resolve

Most people have had the experience of taking what they thought was a good shot only to find, when looking at the print or slide, that it is not as sharp as they anticipated. There are a number of reasons why this happens, including camera faults and poor technique. But lens faults are [illegible] a significant cause of poor results, so it is useful to be able to test the quality of lenses.

The function of a camera lens is to reproduce, as accurately as possible, an image of the original subject. The perfect image is unattainable, however, as lens aberrations cannot be fully corrected. This means that the image quality inevitably varies from centre to edge and at different apertures. And even an otherwise perfect lens suffers from the effects of diffraction.

In addition, the complexity of a lens and the fact that each element is ground and polished individually, rather than being cast from a mould, means that individual variations and the accuracy of assembly will give variations in performance [illegible] to [illegible] the same design. To [illegible] quality control and [illegible] the performance variations, tests have been devised, most of which [illegible] the resolving power. All of them are [illegible] but a simple test can give a fair picture of performance.

Kim Sayer

Fall off *With every lens, definition deteriorates towards the edge of the frame*

Lens testing charts

The assumption is that the complete assembled lens is to be tested, and not the individual elements. A prime criterion of performance is the resolving power (see page 1[illegible]) of the lens, that is its ability to distinguish between closely spaced points in the subject, as limited by residual aberrations and diffraction.

To test for resolution, and obtain a numerical value for it, a test chart (sometimes called a test or target chart) is used. Instead of point source, this has short parallel lines printed on paper. Many patterns have been devised, but most use black bars or lines with a length to width ratio of 5:1 printed on a white background. These are often grouped in two sets of three, with each set at right angles to the other, to test for astigmatism (see page 906).

One bar or line with its adjacent space is called a line-pair. Resolving power is expressed in terms of *spatial frequency*—that is, the frequency with which the lines appear on the image—and this is measured in line-pairs per millimetre or lpm—also sometimes known as cycles per mm. The bars are in groups of decreasing spatial frequency and distributed over a large area—often more than a metre square—to cover the whole field of view of the lens. If a bar has a width of 0.1 mm, the line pair is 0.2 mm wide, and gives a spatial frequency of 5 lpm.

This is the fineness of detail which the average human eye can perceive in a 6×8 inch (153×2[illegible] mm) print at a distance of 2[illegible] mm. This frequency is often quoted as a minimum standard for resolution in prints. But although the spatial frequency which must be resolved in the print is only 5 lpm, for a 35 mm shot to produce this result the image on the negative must resolve 30 lpm, as it needs a [illegible] enlargement to reach the required print size. Most lenses will give far better resolution than this even at full aperture, so greater enlargements are possible.

When a test chart is photographed, it is very unusual for the image size to be the same as the object size (1:1 reproduction). The size is reduced in the image. A 5 lpm pattern which is reduced 20 times will produce a spatial frequency of 1[illegible] lpm on the film.

Tests for resolving power also depend on the *Target Optical Contrast* (TOC). A high contrast helps the lens to distinguish between the lines and spaces and so [illegible] a higher value for resolving power. Most test charts have a high TOC.

Photographing the chart

The actual image of the test chart formed by a lens can be examined using a microscope. This prevents the results being affected by the film and processing. But for most people it is necessary to record the image on film and examine the negative.

It is important that the chart is evenly illuminated and photographed with the camera solidly supported, with the film plane parallel to the chart. The position of the film in the camera is normally marked by a film plane symbol, a circle with a line through it. The distance from the lens to the chart is [illegible] times the focal length of the lens, which gives a 20:1 reduction from chart to image. By using this set up, the chart fills the frame and the

spatial frequencies of the bars in the image correspond to the values on the chart

The chart is photographed using a slow, fine grain film in order to record as much detail as possible. The film is exposed and processed carefully, as too much or too little exposure or development can affect the results. Even when perfectly exposed and developed, film cannot record all the detail given by a top quality lens. So the information about performance given by these tests is for the lens plus film combination

A line or bar is resolved if it can just be distinguished from the background. Practice is needed to judge this, and a powerful magnifier or microscope is required to examine the negative. This technique does not allow the absolute performance of the lens to be measured. But standardizing the film and development allows different lenses to be compared. Furthermore, the same lens can be compared at different apertures, and across the field of view. The accuracy of the focusing system or scale can be checked by repeating exposures at various settings of the focusing ring. Any darkening of the image towards the edges shows that the lens suffers from vignetting. And distortion—barrel and pincushion—is revealed by bending of the straight edges of the chart

A typical resolving power for a good lens is 100 lpm at the centre of its field, dropping to 35 lpm at the edge at its best aperture

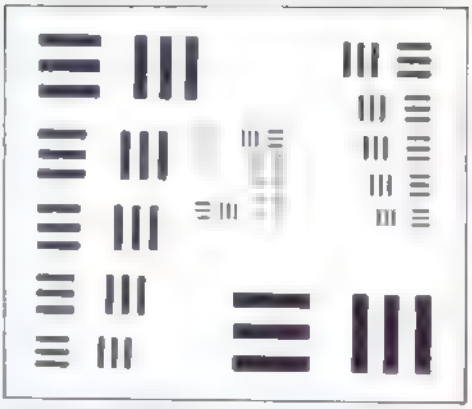
Infinity tests

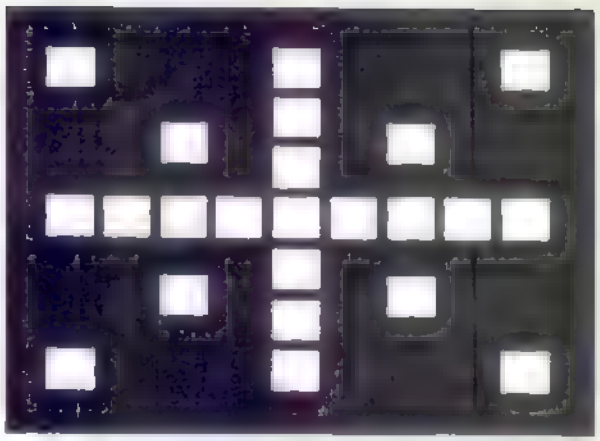
By their nature, test charts must be photographed indoors at comparatively close distances. This can be unsatisfactory for a number of reasons, the most important of which is that most lenses are designed to perform best with distant subjects

One way to simulate an infinitely distant subject is to use a *collimator*. This is a well corrected lens used to form a tiny point of light, which then becomes the object for the lens under test. This is called a *star test*, and a number of aberrations, such as coma can be detected by it. If such aberrations are present, the point is distorted. However, this is a laboratory method which, once again, uses a microscope to examine the actual image formed by the lens, rather than using film

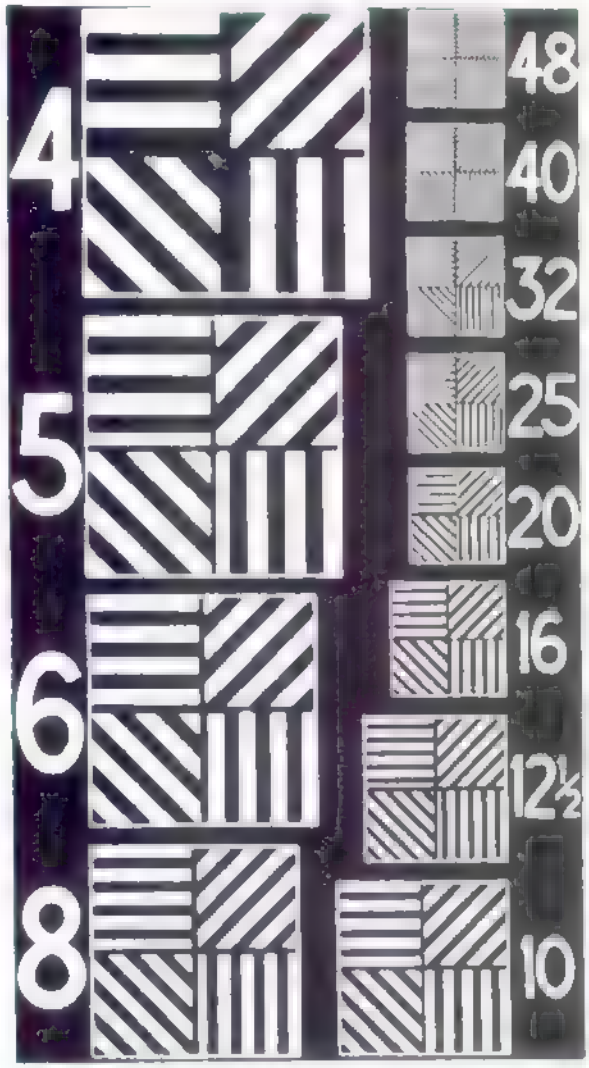
MTF tests

Testing using bar charts only gives an indication of resolution. The slightly more subjective aspects of sharpness and definition are not accounted for. A more sophisticated test method using the *Modulation Transfer Function* (MTF) can allow for contrast (which affects sharpness) and is dealt with in a subsequent article



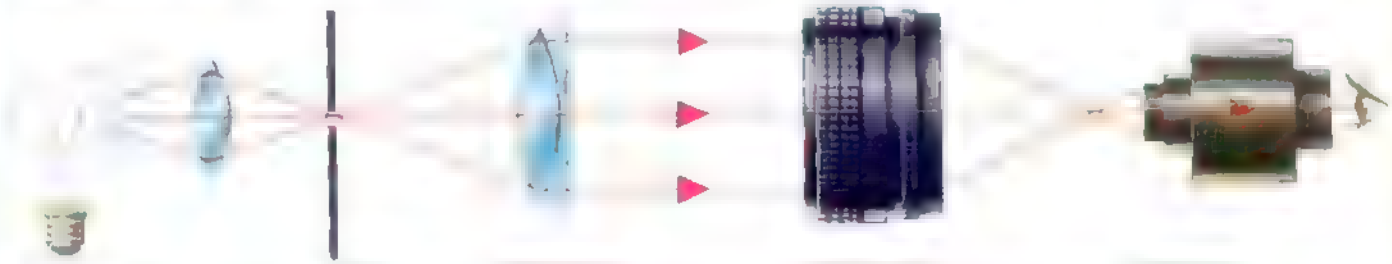


Test charts *The basic design (left) is repeated over a large area (above right). Another chart design is shown on the right. These illustrations cannot be used to make your own tests*



Infinity test *The collimator set-up effectively produces a subject at infinity, and can reveal lens aberrations*

Star testing using a collimator



Brian Griffin

Brian Griffin is a young English photographer who produces haunting, evocative portraits. By his very individual use of light, he creates striking images to illustrate his subject's personality

David Bailey

Brian Griffin

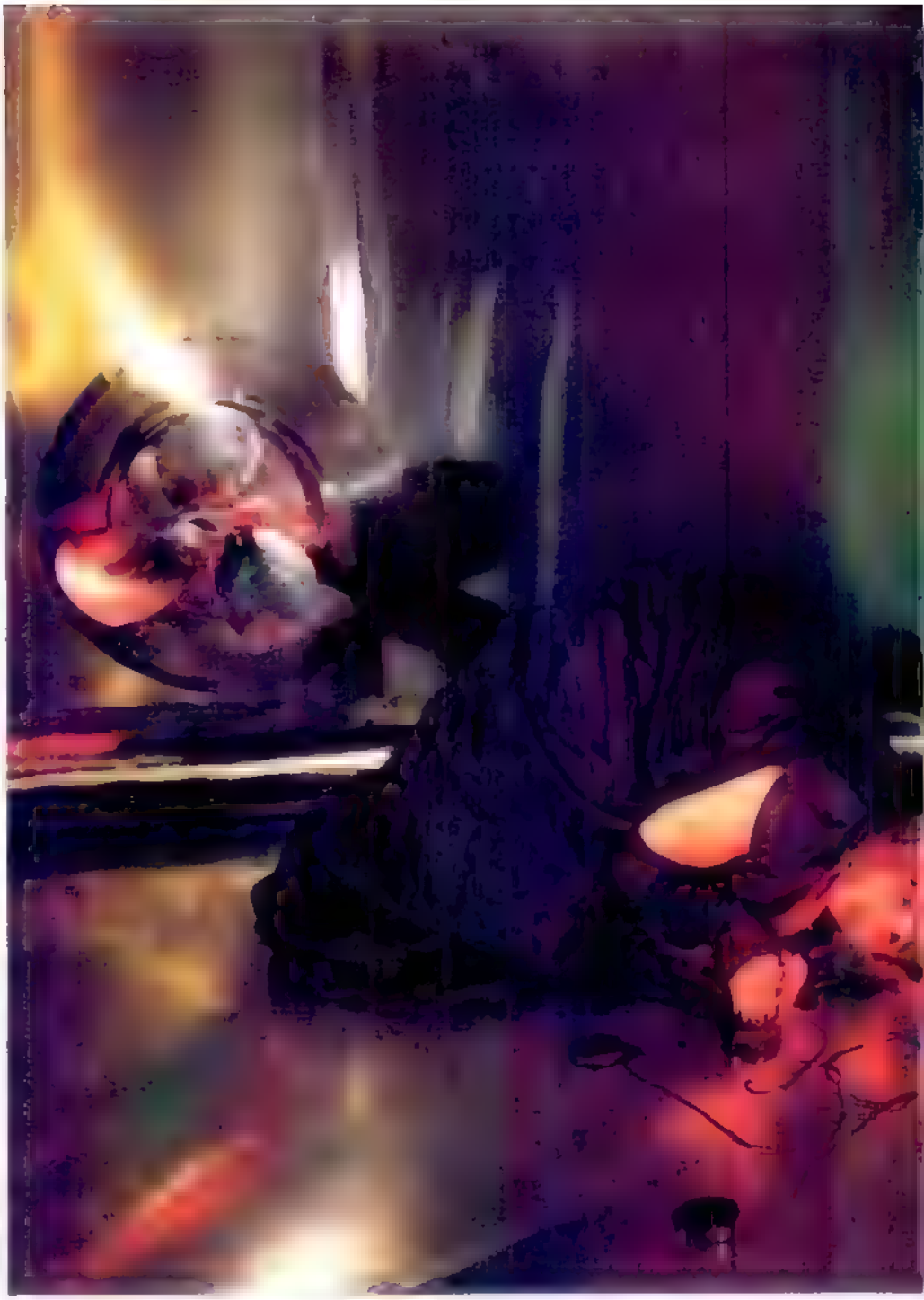
Brian Griffin *set out to photograph David Bailey and ended up at the end of the session as the main subject of what is also a striking David Bailey self-portrait*

Chairs *Taken in the empty ballroom of a hotel in Manchester. Griffin made a stack of some of the gold chairs, which actor Jeremy Irons used as his set*

Man in middle *Griffin photographed Len Murray, leader of the British union council, between two doors to symbolize a man working with both unions and government*

Brian Griffin

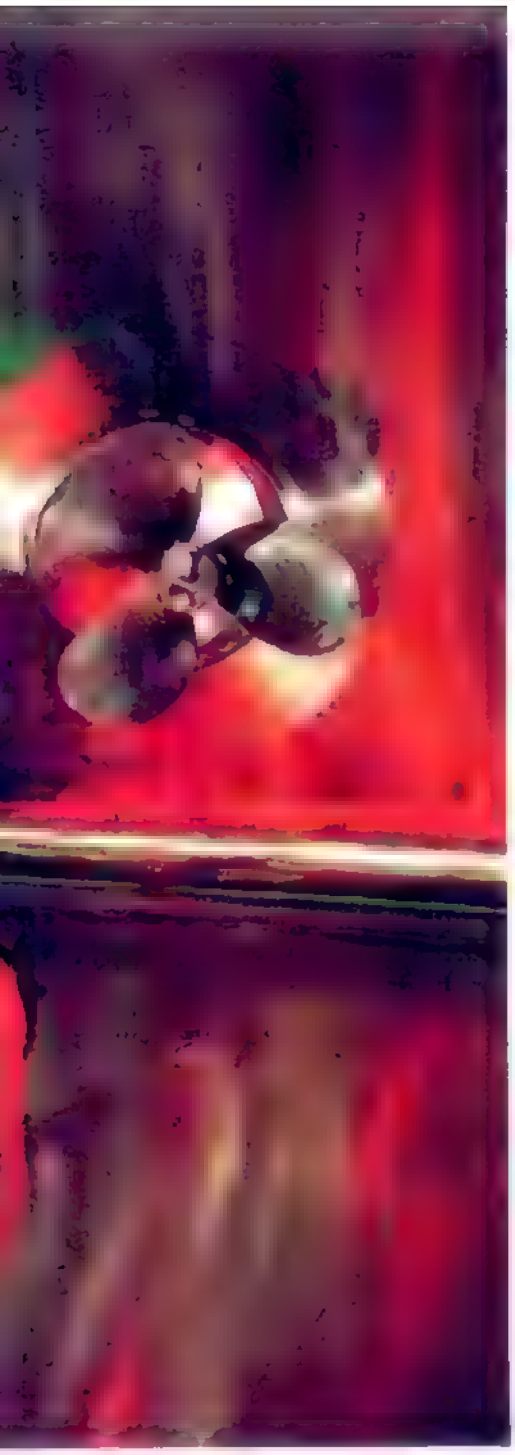
The Ozalid executives *The lighting and arrangement of the figures is typical of the early work Griffin was doing for 'Management Today'*



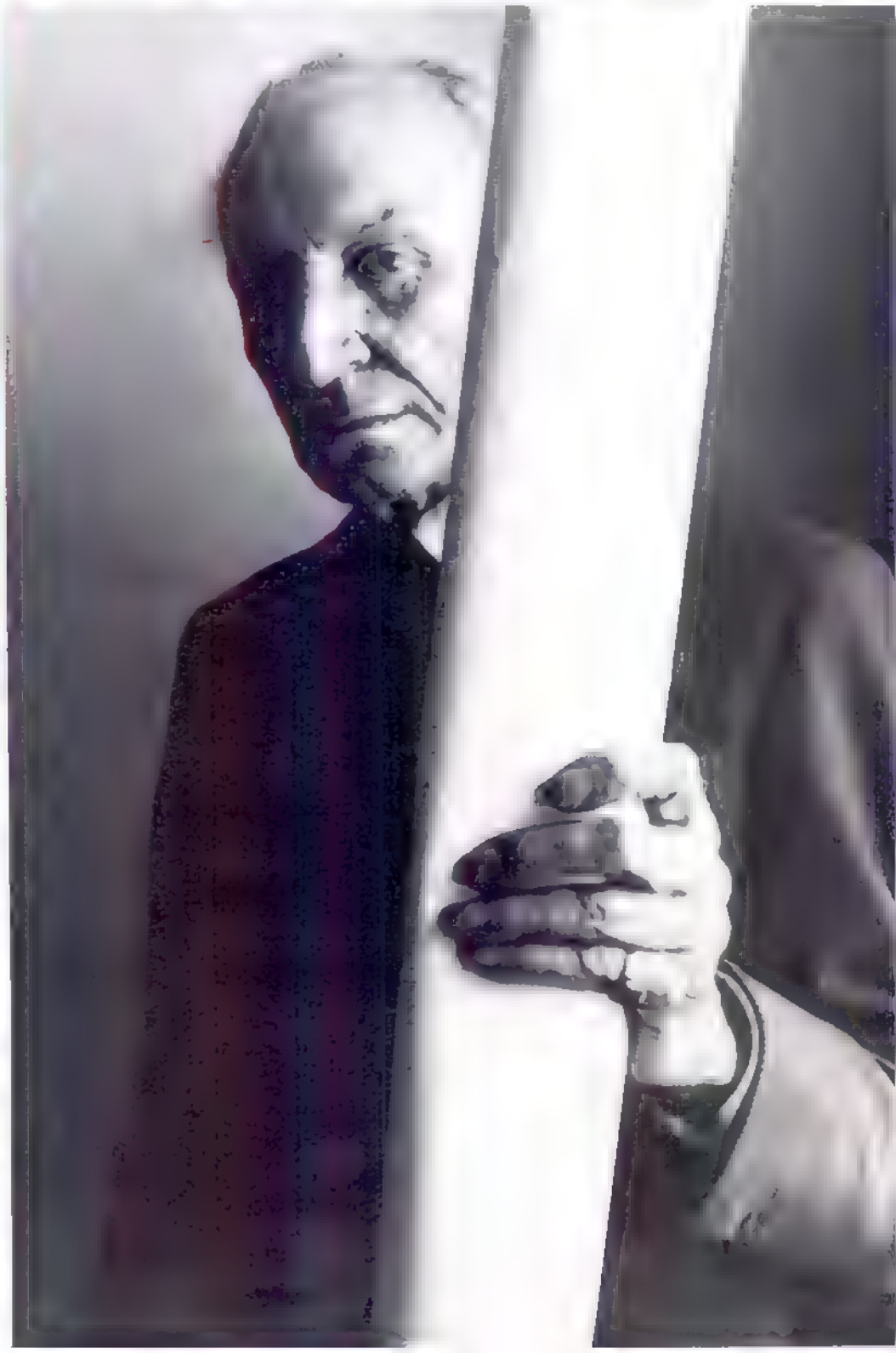
Lene Lovich *One of a series of shots taken in a vast stainless steel beer tank for Lene's record cover. She wore several outfits for the session*

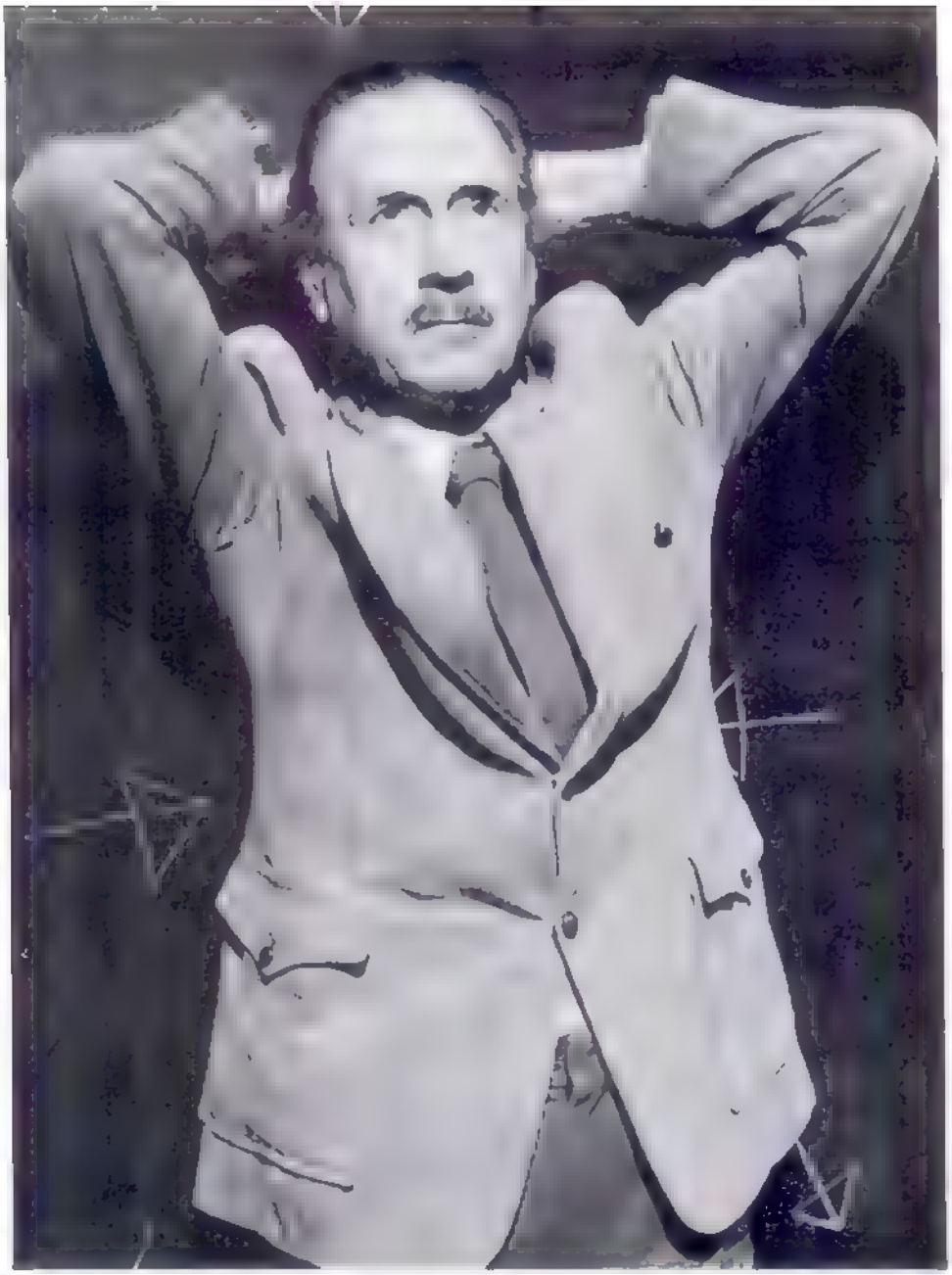
Shoe shot *A shaft of sunlight shining between two pillars makes this powerful image used on the cover of Joe Jackson's album 'Look Sharp'*

Brian Griffin



Sir Alec Issigonis *The designer of the Mini car was photographed at his home near Birmingham holding a roll of technical drawings*





Marshall McLuhan *Griffin photographed the writer against the blackboard in a lecture theatre. Griffin chalked the arrows on the blackboard to suggest an energy flow*

Shoe manufacturer *A portrait of Manolo Blahnik who runs a number of quality shoe stores. 'He put up his hand to shield his eyes from the bright lights and I took the shot'*

Iggy Pop *It is unusual for Griffin to be able to get to know his subject, but in this case he spent two weeks with the singer before taking the cover shots for his album 'Soldiers'*

Budget studio flash

The versatility of amateur studio flash systems enables you to achieve professional results impossible with simple hand-held units

If you are planning to adapt a room in your home for use as a studio, you must give serious consideration to the lighting you may have the greatest advantage of is that you can create the conditions you want. The first requirement for studio lighting is that it should be as versatile and easy to control as possible.

Although you can sometimes use light from a window, this has the great drawback that you cannot control either the direction or the quality of the light. You have no control over timing either and you will often find that the light is switched off when you want it most.

There are two ways of obtaining light that are ideal when you need to lighten a set and electronic flash. Each has its advantages and disadvantages.

Tungsten lighting is comparatively cheap and gives excellent results. It can sometimes be uncomfortable and the bulbs get very hot. But the tungsten lamps on the other hand can give good results if used off the camera and bounced. But it has the great disadvantage that you cannot see the quality of the light before taking the shot. Unless you have experience of photography, the results are often disappointing. Low power they are not suitable for repeated flashing into a diffuser or reflector and the batteries tend to run down very quickly.

Studio flash

The solution to these problems lies in flash, which has been designed primarily for use in the home. Unlike the mains powered and battery operated hand-held units, studio flash units have a ready light to show when the flash is ready to fire again.

Some of the great advantages of studio flash units is that they always have a modelling lamp. Lamps do not produce heat to the flash head and stay on continuously, giving off a light whose direction properties are very similar to that of the actual flash unit. In this way you can see the effect of a given light combination.

Many modelling lamps are provided to cut the power output of the lamp. The higher the flash setting the brighter the modelling light. This is an advantage, especially if you are using two units because it will only affect the

Girl in red *Sophisticated professional looking lighting arrangements are possible even with the most basic electronic studio flash units*

Flash power and exposure

Flashmeter
Manufacturers' recommendations cannot always give the accuracy needed for exposure and a proper flashmeter can be an invaluable extra. Unlike some, this Minolta meter gives a reading directly in f-stops

Dave King

Studio flash
The Bowens Bo-lite 200 is an inexpensive unit that comes with reflector and modelling lamp. A wide range of accessories is also available

Kim Sayer (Copyright Courtesy Courtenay Photonics)

Flash systems

are fundamentally the same as those for the other types, each with a battery a soft box or diffuser, honeycomb, reflector and umbrella. The six system can be bought as a complete kit with three heads, lighting stands and accessories in a compact carrying case. The heads travel out in, each case.

Another system, the Multiblitz Portable system, combines the advantages of both portable and studio flash, providing a modular system suitable for both studio and outdoor work. The unit consists of a power pack, flash head and power source adapter. The essential feature of this system is that it can be used as a portable flash when fitted with a battery pack and a flash head without a

Kim Sayer equipment courtesy Courtenay Photonics

Kim Sayer

Studio flash systems *Like the Bo lite the Courtenay Colorflash (above) is an inexpensive unit with a power output of 100 joules giving a guide number (in metres) of around 30 with 100 ASA film The Multiblitz Mini Studio 202 (left) gives twice the power and recycles rapidly, but costs a little more. The sophisticated Bowens Monolite system (right) is even more expensive, but it can be built up gradually rather than purchased outright*

modelling light. Alternatively, it can be used as a hand-held system when the flash head is changed for one with a modelling lamp, and a remote adaptor fitted. There is even an optional accessory which allows the unit to be

George Wright equipment courtesy Keith Johnson Photographic

powered by a car battery and the full range of accessories is available including a carrying case.

Among the more sophisticated kits is the Bowens Monolite series. The Monolites are cylindrical modules made with built in modelling lights. These are switched on in proportion to the flash power output. There is also a motor for switching the modelling lamp to full brightness which is very useful when focusing and a fuse which extinguishes the modelling light in the flash tube, switching it on afterwards. The Monolite 200 E has a rating of 200 joules and a guide number of 34 with 100 ASA film.

A more powerful version the Monolite 400 E gives a maximum power of 400 joules and a guide number of 48 with 100 ASA film. Top of the range is the Monolite 800 E with a power output of 800 joules and a guide number of 67 m with 100 ASA film. This model also has a recycling time of ½ seconds and a four power output selector.

The Monolites have sockets for flash

On the bench *Some systems can be used outdoors as well as in the studio—the Profilite runs off a normal 12 volt car battery*

Kim Sayer equipment courtesy Bowens

[illegible] and an overheat cut out device. This accessory is available for a very [illegible] range and there are a variety of reflectors and devices for controlling light. These include [illegible] lightweight to heavyweight [illegible].

Similar to the Monolites is the Quantum [illegible] range. There are Power [illegible] in this range the [illegible] the [illegible] 4 and the [illegible] 8 [illegible] models are identical to the Monolite units.

Choosing a system

The first thing you must consider when you buy studio flash is the power output you are likely to need. If for example you may intend to shoot close up of head and shoulder portraits at fast shutter speed then an ordinary [illegible] of the less powerful studio units, say one with 100 joules output, should be quite adequate for your needs. On the other hand if you want to photograph groups then you need a much more powerful unit. It is better to buy more power than you need than to buy less because you can always turn a unit down if necessary but you cannot increase its maximum power output.

The number of accessories you buy depends on the amount of work you intend to do as well as on the type. The range of accessories is vast and not all of them are essential at least at first. Some [illegible] are important. An umbrella is perhaps the most useful item but different umbrellas can be made with different patterns. Some are much more suited than heavy black paper or cloth.

Don't forget that the more [illegible] you buy the heavier the equipment will be and it can be very [illegible] to carry around. If you are not intent on [illegible] too much this is not too important but you should still avoid buying items you do not really need. The best method is probably to build your system up slowly starting with essentials and adding things as you need them over time.

You might also try looking at what is available in the second hand market as a number of good studio units might be found in perfect condition. A new system, and/or [illegible] alternative worth considering if you are working on a tight budget.

Although not in the same [illegible] as powerful as some of the more expensive hand held units and they are [illegible] to use the [illegible] far outweigh the disadvantages. [illegible] the control you can achieve over the intensity and quality of the light [illegible] a far wider range of possible lighting effects.

For a photographer who plans to do studio work regularly a studio flash system is essential equipment. If you [illegible] work for you then you must decide what power output you require and have your [illegible] on this [illegible]. If you choose the right [illegible] system, it should prove to be a very worthwhile investment.

Improve your technique

Shots against the light

When a light source and the scene it illuminates both appear in a picture, the capabilities of film, lens and photographer are stretched to the limit—but the final image can be brilliant

[illegible] straightforward [illegible] and extra care [illegible] flare [illegible]

How to avoid flare

The [illegible] photographing a [illegible] brilliant [illegible] light [illegible] the rear element [illegible] the film no longer [illegible] image of the [illegible] but [illegible] flare.

The [illegible] of flare [illegible] the other [illegible] light [illegible] the film. The [illegible] flare is a reduction in [illegible] colour [illegible] saturation and [illegible] atmosphere to the [illegible]

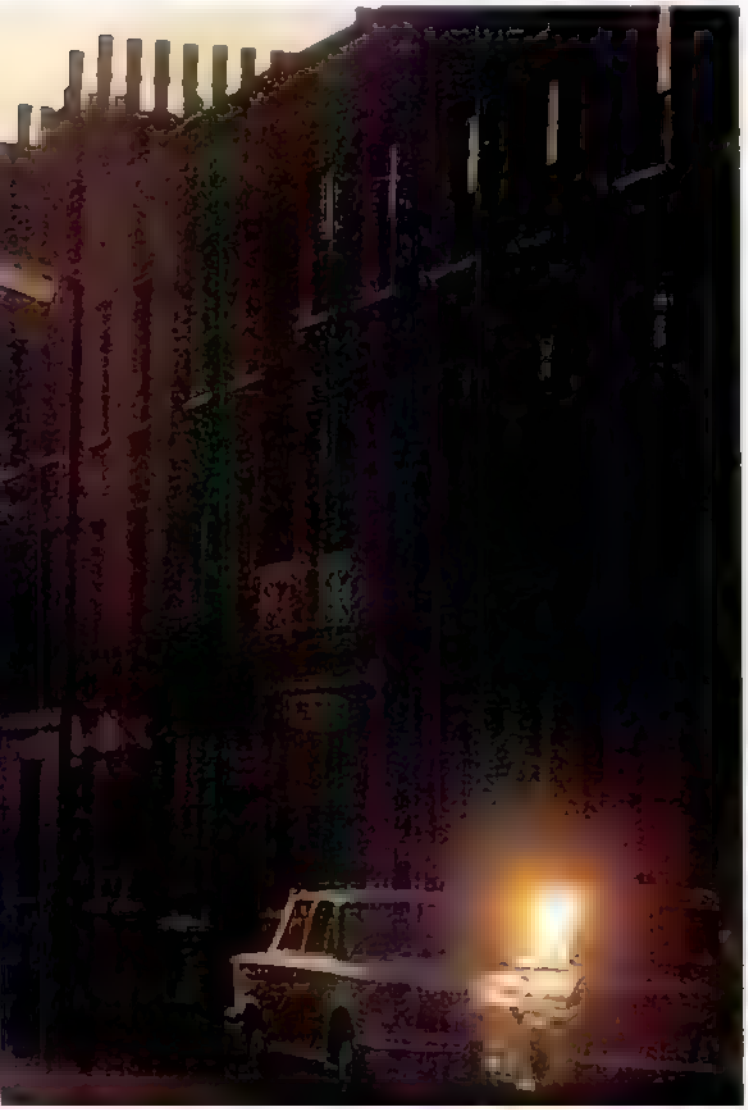
Further trouble from [illegible] when powerful light [illegible] the rear element [illegible] striking the film [illegible] reflected back into the [illegible] a secondary image. Since the reflected rays do not follow the same path as the original ray, the [illegible] bright light [illegible] the picture.

The other effect within the film is a form of diffusion. Light [illegible] striking the silver halide grains are reflected on to [illegible] and not directly [illegible] the result [illegible]

Sunlit silhouette *Exposing for the sky and sun reduces subjects in shadow to a stark black outline*

Black car *One or two stops extra exposure is needed if a light source is visible—a TTL meter is easily misled*

Robin Laurance



Reflected glow *Deliberate underexposure can make a good picture from a dull subject*

Roadside view *Backlighting can cause flare that softens the image, and cuts down contrast*

Sally & Richard Greenhill

Getting the exposure right

Headlight trails *To prevent flare in night pictures, carefully clean your lens, and avoid the use of a zoom*

Peter Coughran

Music lesson *Fill-in flash helps to put light into the shadows when the main light is behind the subject*

Sally & Richard Greenhill

Robin Bath

windows—may be the only parts of the subject that are bright enough to appear on film Here, shadow detail usually disappears completely, so overexposure of the light sources is not so acceptable—they make up the principal subject.

Each individual case must be judged on its own merits Think carefully about which part of the picture constitutes the main point of interest—are you trying to take a photograph of the light source itself, or is the area that it illuminates more important? The TTL meter in a camera generally indicates an exposure which records a plain subject as an even mid tone on the film To measure the exposure, then, you must first decide which part of the subject is to appear as a mid tone, and take a selective meter reading from that part

In the case of the backlit portrait, mentioned above, the model's face is the area which is to appear as a mid tone Though this is in shadow, it is the area from which you must take a meter reading. The sun is still included in the picture but in this case, it forms a burned out area of overexposure.

For the night scene, the situation is different Here, the important parts of the picture are the light sources and the areas around them, so your meter reading should concentrate on these parts of the picture and not on the shadows A reading taken from the roof of a car parked under a street lamp should suggest an appropriate exposure

If you have an automatic camera, *key tone* readings like this may be quite difficult. If possible, use the camera manually, or use the memory lock button if your camera is fitted with one A straight reading taken in the normal way will almost certainly lead to underexposure when a bright light source is in the picture, unless it is balanced by an equivalent amount of deep shadow, so if you have neither manual control nor a memory lock, you may be able to get the correct exposure by using the backlight button or exposure compensation dial, which should be set to ×4, or +2. Alternatively, reset the ASA dial to a lower film speed—this will also result in extra exposure As a further precaution against incorrect exposure, try and bracket your pictures if you can, by making exposures at one stop above and below that recommended by the meter

The problems that crop up when a light source appears in the picture are very similar to those encountered when lighting comes from behind the subject or from one side. The harsh contrast that this sort of lighting generates can be reduced by using fill-in flash, or a reflector to put light into the shadows

Using flare creatively

It is not always necessary to totally eliminate flare, and sometimes it can be used to brighten up a dull picture. The two different types of flare—general veiling flare and octagonal diaphragm spots can be generated in different ways and each gives quite a different kind of feel to the picture. Veiling flare conjures up a misty, romantic mood, but brightly coloured flare spots give an impression of dynamism, and a modern, active look

Sun and flowers *Octagonal flare spots need not spoil your picture. In this image they echo the drops on the leaves*

Veiling flare is only too easy to produce. Pastel and soft focus filters rely on it for their effect, but there are simpler, cheaper ways of introducing it Lining a lens hood with crumpled metal foil is a sure way of doing this—pieces of gauze or crumpled cellophane partly covering the lens are equally effective Try breathing on the lens in cold weather Though this requires no extra equipment, it is rather unpredictable Using a zoom lens at full aperture is a sure way of generating flare when the light source is visible in the picture.

Flare spots are slightly more difficult to control Set the lens to its minimum aperture, and press the stopdown button on your camera. If you then point the camera at the light source, flare patterns are usually clearly visible, but their position in the frame depends on that of the light source itself Getting the string of colourful octagons where you want it may not be as easy as it seems They show up best where they cross an area of shadow, and can be almost invisible on highlight areas

Assignment

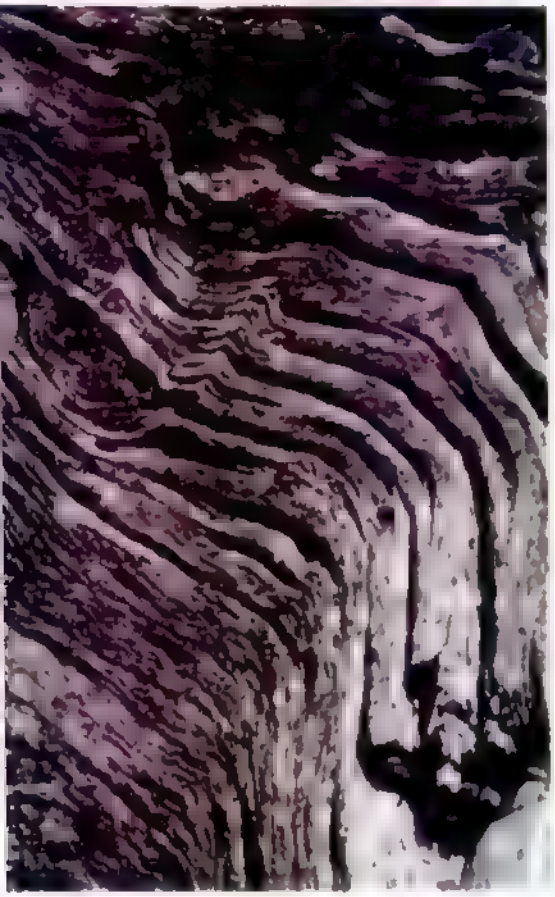
Nature walk

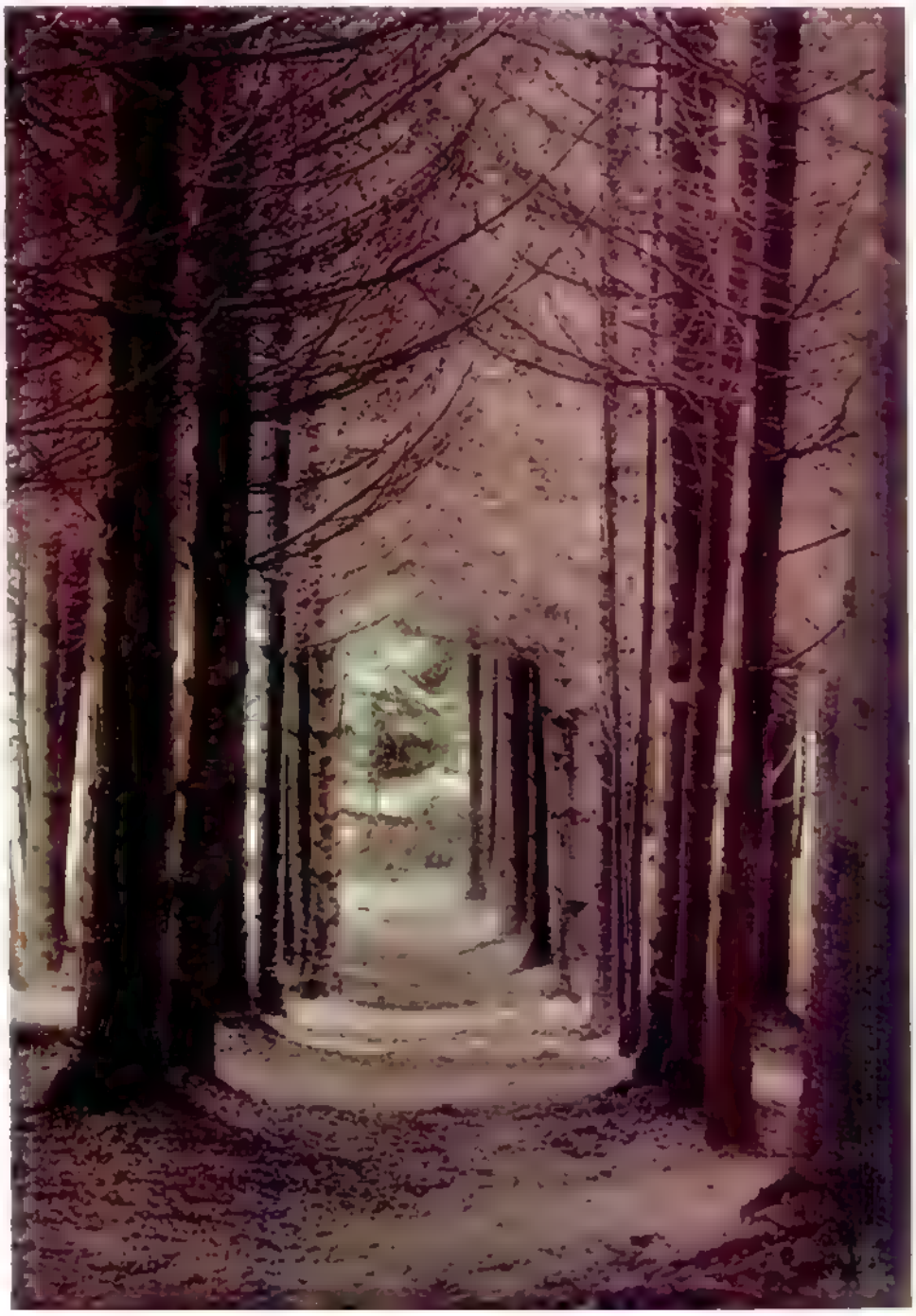
Walking in the country with a camera is a popular pastime. We accompanied Colin Molyneux, the noted landscape photographer, on a walk in the Welsh hills

Colin Molyneux lives in Wales, about [illegible] km from the hills of the Brecon Beacons. This area contrasts greatly with the East Anglian coastline where Trevor [illegible] a great friend of Colin's photographed aspects of the coastline (see [illegible]) so it is interesting to compare the two photographers' approach to the subject.

Colin made no concessions to portability as he set out. He had a Nikon F3 body with motor drive, an 80-200 zoom, four other lenses and a wide assortment of meters, filters, viewfinders and other accessories, including a compass. In addition he carried a sturdy tripod which he used for most of his shots. 'I can't hold the camera still otherwise,' he joked.

The film he chose was Kodachrome 64

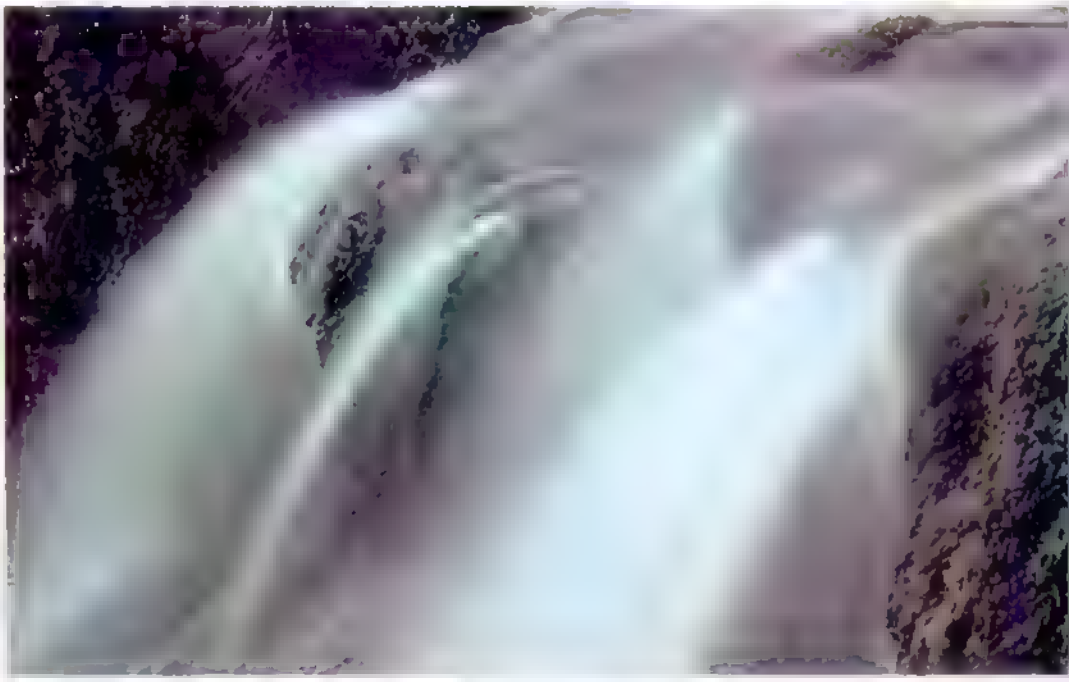




Bark *A fallen tree, which the casual walker might overlook, offered endless possibilities for studies of shape and texture.* **Foxglove** *Colin's 200 mm macro lens allowed him to choose a completely black forest background.* **Woodland avenue** *The incident light meter gave 4 seconds at f 8, but Colin finds that low light readings are often unreliable so he gave exposures of 5, 10, 20 and 30 seconds at f 11. There was little to choose between the 5 and 10 second exposures, but the 10 second shot, shown here, gave the best results*

photographs by Colin Molyneux

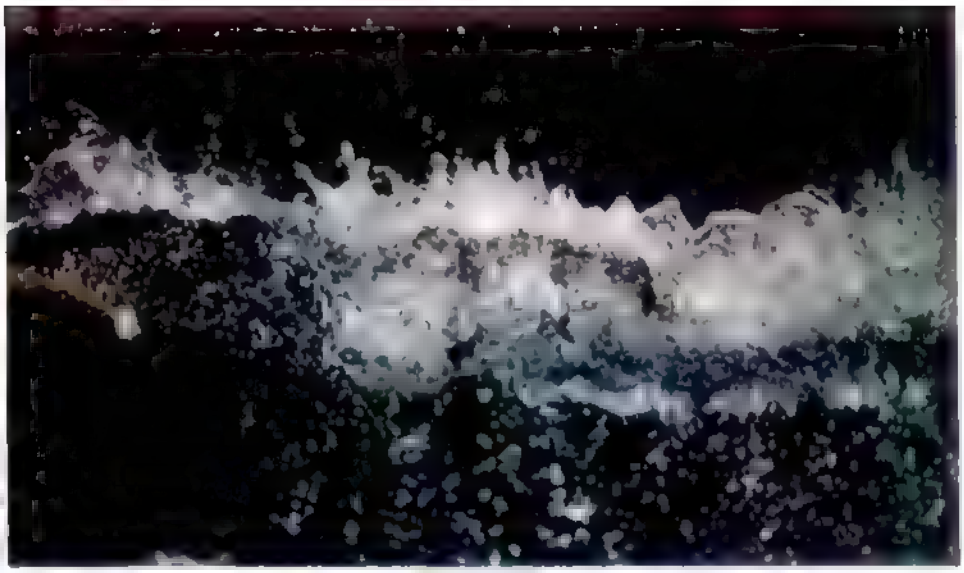
Long shot *This overall view of the area has simple shapes, but includes plenty of interest in the variegated greens of the trees.* **Waterfall** *Colin experimented with different exposure times. For this effect he gave a 5 sec exposure using a neutral density filter to avoid overexposure.* **Ferns** *Patterns feature in this 200 mm shot*

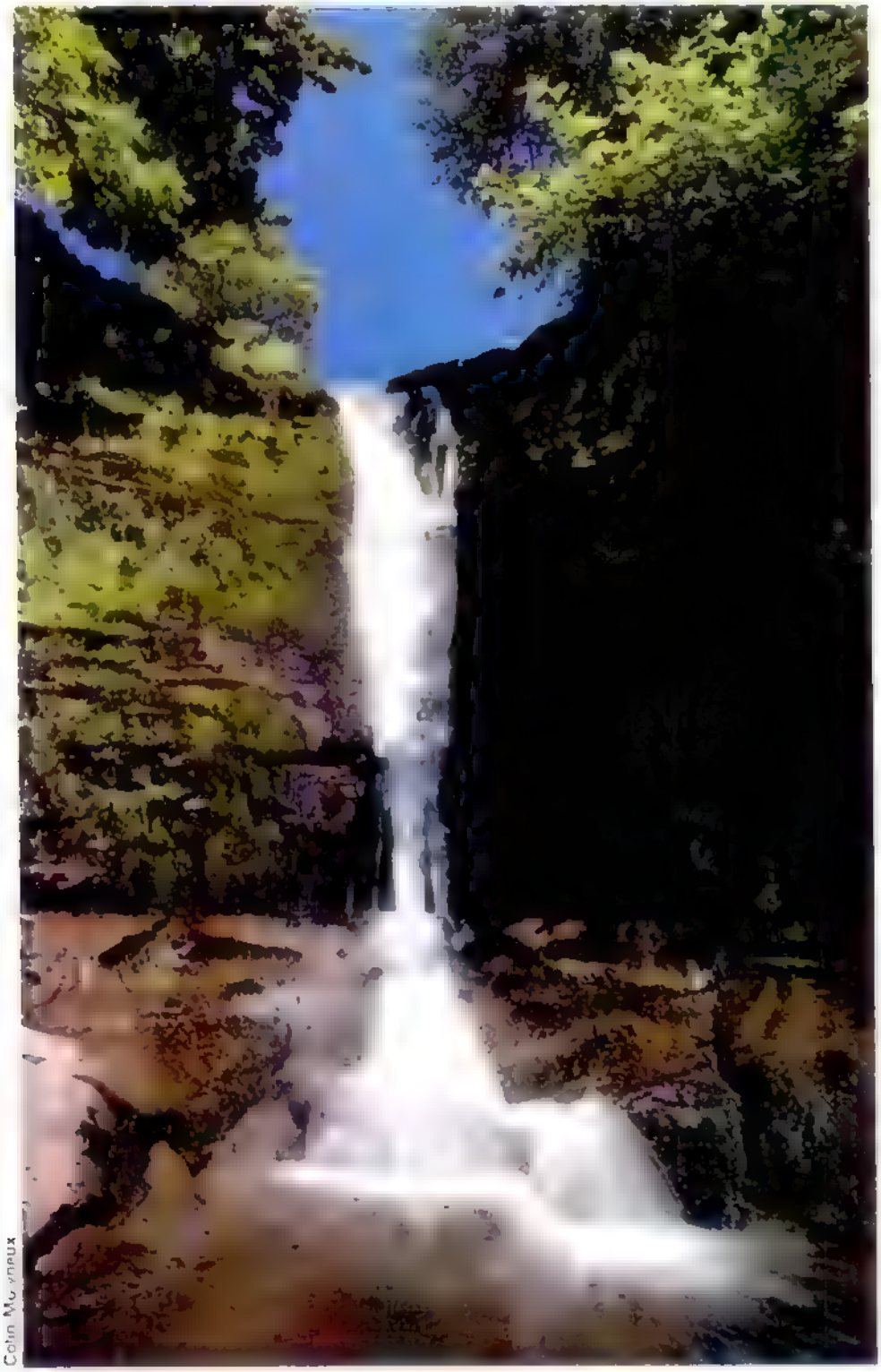


which he uses whenever possible. I have great sympathy with Trevor Shand over the relative merits of Kodachrome and Ektachrome, he said. I don't like the Ektachrome look.

Most of Colin's scenes are filtered with a Nikon R1 filter, which is equivalent to a Wratten 81A rather than the more standard UV or skylight filter. This filter gives a slightly warmer colour, and helps correct any tendency to [illegible]

[illegible]





Colin Murphy

The photographer *Colin uses a tripod for nearly all his shots. Here he focuses on a stone wall with a 55 mm macro lens.* **Droplets** *These form as the water topples over the lip of the fall. 1/500 second was needed on the 200 mm macro lens at its full aperture of f/4.* **The falls** *At the other extreme, Colin used a 20 mm lens with a polarizer to darken the sky in this dramatic view*

for a living beats me. He said as a cloud blotted out the sun for 30 minutes in an otherwise clear sky.

Why do landscape photographers concentrate so much on details of the landscape? You can say a lot with a close-up. Perhaps because I began as a graphic designer I admire simplicity. There's nothing wrong with pretty long shots. But they must be good artistically. They can get very cluttered—telegraph poles are the bane of my life!

It's the little things that interest me that others might overlook, like the way those ferns cling to the rock. I love stone walls too.

He uses his 80-200 Nikkor zoom a great deal for composing his shots. It's heavy, but it's a useful lens—I can get just the composition I want.

When he began taking shots, the motor drive whirred three or four times whenever he pressed the button. A motor drive for photographing landscapes? I use it through force of habit—I used to miss a lot of shots through not being wound on and really I tend to use a lot more film. But at least there's a better chance of not having a shot spoiled by one of Kodak's blue spots in the processing.

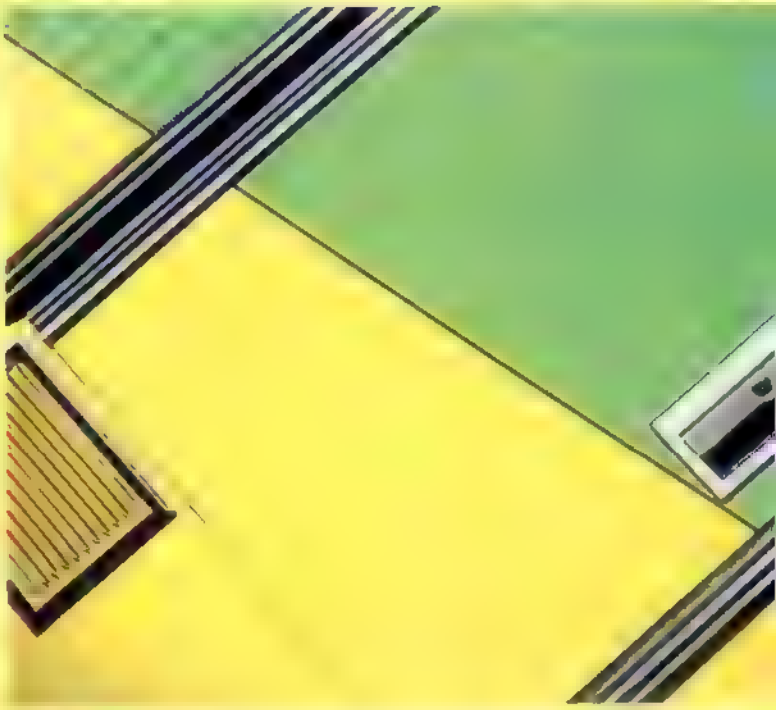
During the day the subject matter and the light varied greatly in contrast. Colin uses an incident light meter but checks its reading with the camera's TTL meter. In overall flat light, he finds there is little difference between them. But in contrasting light the two readings often differ widely, so he brackets the exposures between the two.

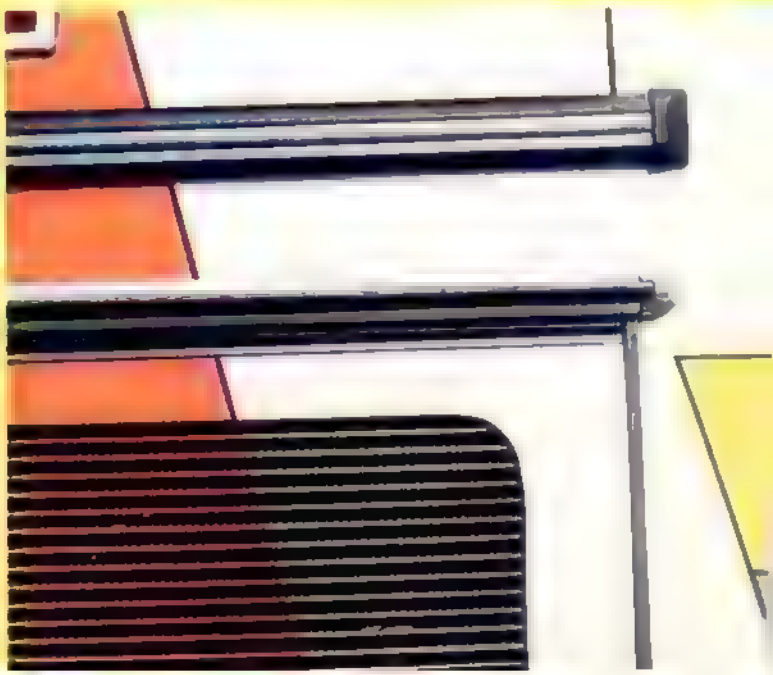
Colin's results show how a wide and interesting range of shots can be taken within a fairly small area by looking closely at the features the landscape has to offer and by taking care over every detail in the scene.

Coach work

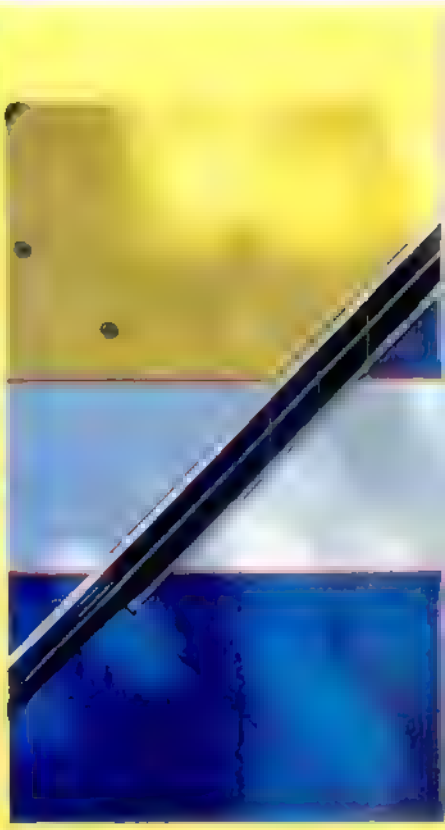
The photographer's imagination is as important a factor as the subject itself in creating exciting images more so if the material is unusual or rather individual

Night light *Ian decided a night shot would make a coach look more striking. A 15 second exposure made the car's lights streak across the foreground adding pace and a feeling of movement.*
Closer view *A 200 mm lens was used to isolate this graphic, abstract detail (left).*





Photographs by Ian McKinnell



The [illegible] that [illegible] to does [illegible] of [illegible] they [illegible] particular [illegible] of picture. C[illegible] and the designs are [illegible] in [illegible] and to [illegible] the [illegible] a small detail so that the viewer is unable to see it in its [illegible] context.

The [illegible] Ian chooses are usually static, [illegible] him plenty of time to [illegible] his viewpoint and to take great care over the composition. Nevertheless he sometimes finds that he has to work quickly if an interesting coach [illegible] appears. To make the most of the [illegible] Ian tries to avoid working in [illegible]. As he [illegible] to get the intensity and saturation of colour, together with the [illegible] I [illegible] situation.

[illegible] photographs [illegible] particular of the designs [illegible]

Exposure [illegible] for [illegible] when concentrating on [illegible] especially if there are large areas of white or [illegible] coloured [illegible] which would make a straight exposure reading yield a [illegible] very [illegible]. To overcome this Ian normally takes a [illegible] The [illegible] exposure [illegible] slide [illegible] of it.

A *A straight wide angle view of the coach lacks interest—moving in closer gives a more interesting image* **B** *Here the shape of a wheel has been juxtaposed with the strong straight lines of the coachwork* **C** *By tilting the camera at an angle the image gains impact from the strong diagonal and the bold division of colour* **D** *The grille and the chrome trim supplements the painted designs* **E** *Carefully framing a coach against a familiar setting leads to a different type of shot* **F** *Here the reflections of the city lights give an attractive effect* **G** *Mixed diagonals and horizontals, together with the divisions of colour they produce, are typical of Ian's approach* **H** *An unusual viewpoint and the reflection of Sacré Coeur create an individualistic image* **I** *Even a familiar viewing angle can yield an unusual photograph if the details are framed selectively and the composition is strong*

Improve your technique

Making movies

Metropolis

If you are new to movie making with a Super 8 camera, a few basic techniques and a little careful planning should help make your first films exciting viewing rather than disjointed clips

[illegible] and name—even [illegible] of the notorious slide [illegible]

[illegible] buddets [illegible] the techniques that are used in Hollywood can usefully be [illegible] learning at [illegible]

The language of films

[illegible] learning a [illegible] and [illegible]

[illegible] of time [illegible] are the [illegible]

[illegible] se obtained [illegible]

1 *The opening shot of the film shows the mother dozing off to sleep, and the child looking bored*

2 *A second shot, from a distance, sets the scene by showing the two characters in seaside surroundings*

3 *A close up on the boy shows him losing interest in the beach, and looking round for other things to do*

4 *This is followed by a brief shot of the pier—a point of view shot—which shows what he sees*

Metropo-S

A seaside story *The most important characteristic of a film is that it tells a story, and when you plan a film, you should make this narrative structure as clear as possible. The series of pictures on this and the next two pages show how a simple story line can be built from an afternoon's filming on the beach. This short sequence was conceived as a silent film —no words are necessary to tell the story—and could be shot with even the simplest of Super 8 cameras*

[illegible] then [illegible] at a time. With your [illegible] for example, you can [illegible] train [illegible] arrives at a station, then [illegible] directly to a shot of the train arriving as seen from the platform. This sequence can be shot later on, when you have been [illegible]

In the same way, by filming different views of the same subject you can give the audience far more information than they would get from a single shot. Think of [illegible] in which you have seen the technique used—a couple sitting in the park can be shown in close-up, then in a long shot to reveal the [illegible] among them of which they are unaware. You need not film the sequences in the same order that they will appear but you should have a [illegible] in your mind before you film such sequences to avoid wasting film.

Planning a film

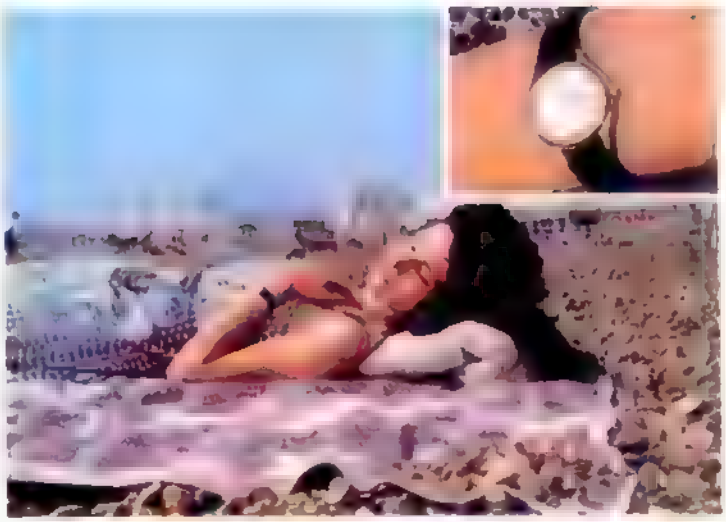
Professional films are planned in every detail and carefully scripted in little is left to chance. Few amateurs are interested in such complex organization, though if all they want is a record of their holiday or of their growing family. Nevertheless, with a small amount of planning you can make an interesting short film out of what might otherwise be a rather dull home movie.

The most important point to remember when [illegible] is that the person watching it sees it as a narrative or story—whether or not this was what you intended. Family and holiday films are usually shown in the order in which they were shot so they automatically form some sort of chronological sequence. What makes many of them difficult to watch though, is that they are very disjointed. Time jumps from scene to scene without any explanation. This can easily be avoided by writing down a plan of what you want to appear in the film [illegible] notes such as [illegible] If you prepare [illegible] in this way [illegible] you to have [illegible] a brief shot of a couple [illegible] to appreciate the [illegible] narrative [illegible]

[illegible]

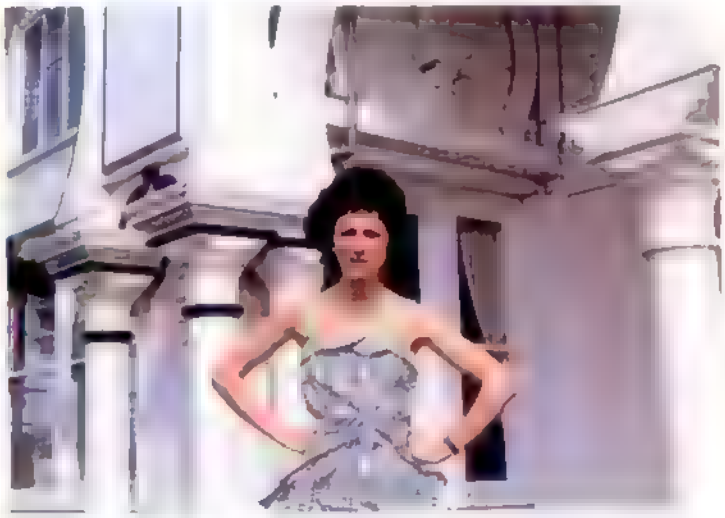
[illegible]

5 *The camera pans slowly along the pier, keeping the boy walking into the frame as it follows him*



6 *Moving back to the beach, the camera zooms in on the wrist watch of the mother to establish the time*

9 *On the pier again the camera pans to follow the mother, who finally leaves the frame at the right*



10 *The mother discovers the boy on the dodgems, and we see a brief view of her angry expression*

[illegible] from [illegible] maintain [illegible] to make [illegible] into a cafe, and then show them [illegible] of coffee, but forget to [illegible] into anywhere [illegible] ly's hands, and a piece of [illegible] counter.

Adding polish

[illegible] problem [illegible] steady. [illegible] tripod with them, all the time [illegible] this is the only way to [illegible] that [illegible] of camera shake. There are a variety of alternatives to the tripod [illegible] as the camera support [illegible] to 989. None of these is particularly heavy and all of them [illegible] to hold the camera steadier than [illegible]

A few movie cameras [illegible] with a rifle [illegible] your camera has one of these, use it whenever possible.

Just as with 35 mm still cameras, camera shake is [illegible] when you are using a [illegible] lens. If your camera has a zoom lens, use it at the shorter end of the focal length range whenever you can. Do not use a zoom lens as a lazy way of framing up the picture, but instead set the camera to wide angle, and walk towards your subject until it fills the frame. This is sometimes impossible, [illegible] views, for example, but this is exceptional, and in most [illegible] it is the simplest and most convenient way of [illegible] sure that the picture on the screen is perfectly steady.

Inaccurate focus ruins almost as many films as camera shake, particularly in dim light, when the lens is set to a wide aperture. [illegible] you should always carefully set the focusing ring before each shot. Even cameras that have a reflex viewfinder similar to SLR still cameras may be hard to focus because of the way the viewfinder is constructed. Such movie cameras usually have an aerial image viewfinder—that is, a clear [illegible] matt one. Although this produces an exceptionally bright image, it makes reflex focusing all but impossible. Some cameras have a split [illegible] for this very reason, and it is advisable to use this if it is fitted to your camera. If it has a zoom lens, use the longest focal length for focusing, where errors are most obvious, then reframe the picture at the focal length you wish to use for the shot.

Changing the focal length while you are filming is very tempting, but is very tiring to watch if it is repeated too often. If you want to move from a broad general view of a scene in to a close up, it is better to stop the camera and move forward, rather than zooming the lens to a longer focal length.

[illegible] zooming is much easier to watch than fast zooming, but it must be very

7 *The boy continues to play on the pier. This shot is held for 12-15 seconds, as there is plenty of activity*

8 *Meanwhile, the mother wakes up, and then we see a point of view shot that shows us the elapsed time*

11 *Another point of view shot—this time a close-up of the boy as he whizzes round the pier*

12 *The final shot brings the film to a clear and definite conclusion—mother and child happily united*

Metropolis

slow indeed to work well. If you watch a TV interview, you will notice that this technique is used a lot on the small screen. But that the zooming action sometimes takes as long as a minute to complete. This is much slower than the power zoom on any 8mm movie camera and few zoom lenses have a speed enough action to make hand zooming at this slow speed possible.

Panning the camera across a scene is like zooming, a great temptation, but unless it is done slowly and for a good reason it is disappointing on screen. It can work when you want to follow a person or car moving across the picture or to set a scene. For example, if you are filming in a market and you want to put into context the bargaining that is taking place at one stall, you might decide to pan across the other market stalls before bringing the camera to rest. Make sure that the objects in the scene take at least five seconds to cross the screen, though, or you will get *strobing* when the film is projected—the images will seem to jump across the screen in small steps instead of moving at a steady pace.

One other way to improve your movies is to make sure that the shots are of a reasonable length. Ten seconds may seem like an awfully long time to hold down the trigger on the camera, but if there is a lot of activity going on in the frame, this is a perfectly reasonable duration for a shot. It is not necessary to make all shots this long, but you should always aim on the long side, as you can easily shorten a shot during editing. There is even a place for brief bursts of one or two seconds duration, such as of a road sign to indicate location, or of a clock to show the time of day.

Sound and editing

If you own a sound camera, you have one more thing to think about while you are filming. Sound can add interest to a film, but unwanted noise is a distraction. Most sound cameras can be fitted with a pair of headphones to monitor the sound and a separate microphone, and both these accessories are worth using, particularly if you can coerce somebody else to control the sound while you operate the camera.

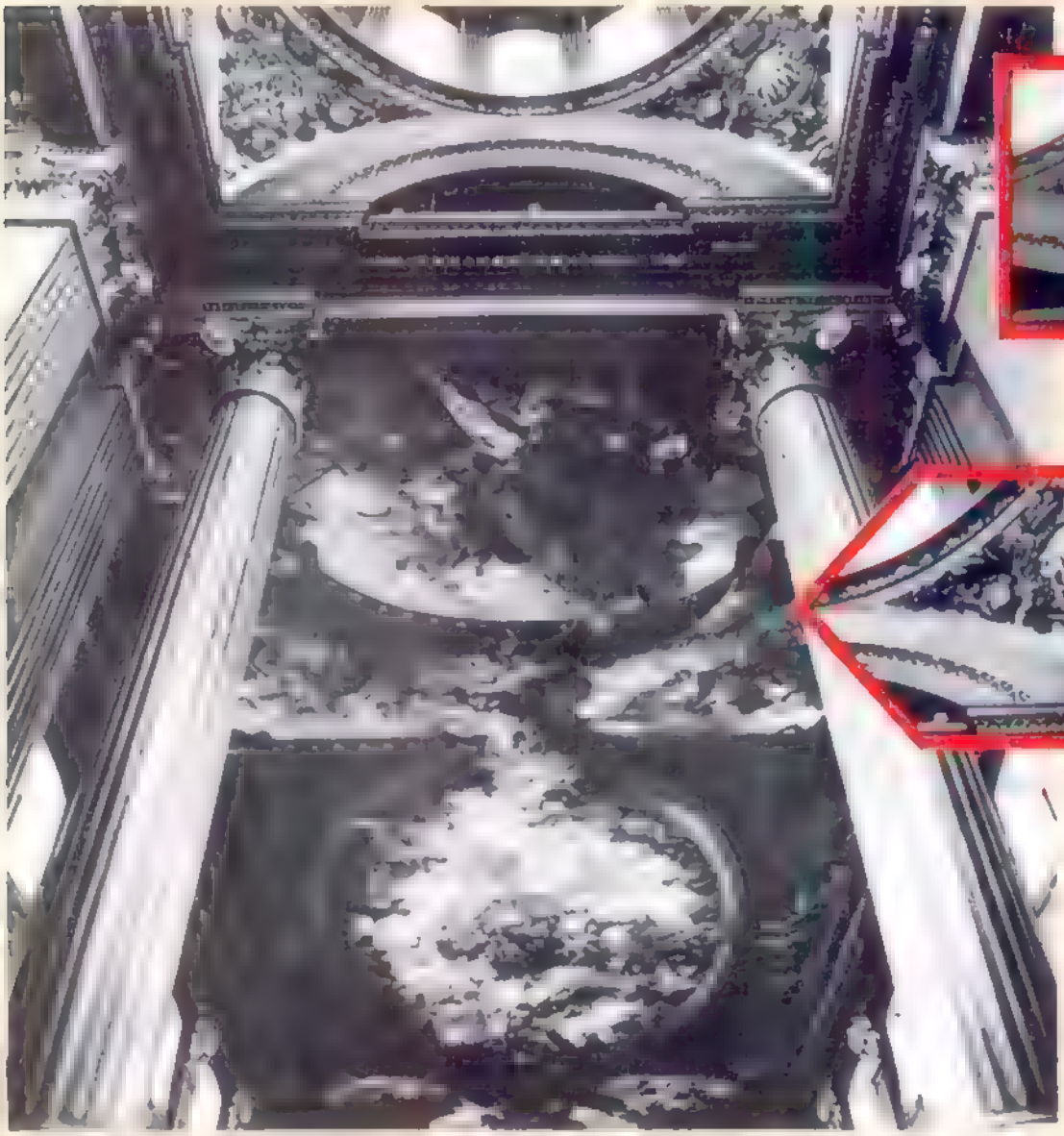
Home movie cameras often generate a loud whirr, and a built in microphone cannot usually avoid picking this up. A hand held mike can be fitted with a long lead and moved several metres from the camera to eliminate this annoying noise and to get a better recording of the source of sound. With music, this technique can be particularly effective. Music can also be added later if you own a projector that has dubbing facilities.

Sound cameras usually have an automatic gain control to prevent the magnetic stripe from being overmodulated in loud sequences, but this can then pick up background noise in quiet sequences. If, for example, you are filming two people talking, try and avoid long breaks in the conversation, or the sound of the camera will gradually increase and become annoying. The gain control, if fitted, should be on its lowest setting to prevent the first few words of a new burst of conversation from overloading.

Editing is in some respects as important as shooting the film. Many movie films have been recorded in the editing room, but it is largely ignored by the home movie maker. By [illegible] and rearranging your film, you can usually improve your movies and remove irrelevant sequences. The subject of editing and cutting is covered in a subsequent article.

MTF curves

Image sharpness depends upon more than resolution of fine detail, and for a more complete picture of lens quality, its Modulation Transfer Function must be measured



M. Hale Freeman

Sharpness *A contrasty shot can look sharp even when resolution is poor (left) A low contrast shot, on the other hand, looks unsharp despite the fine detail shown*

[illegible]

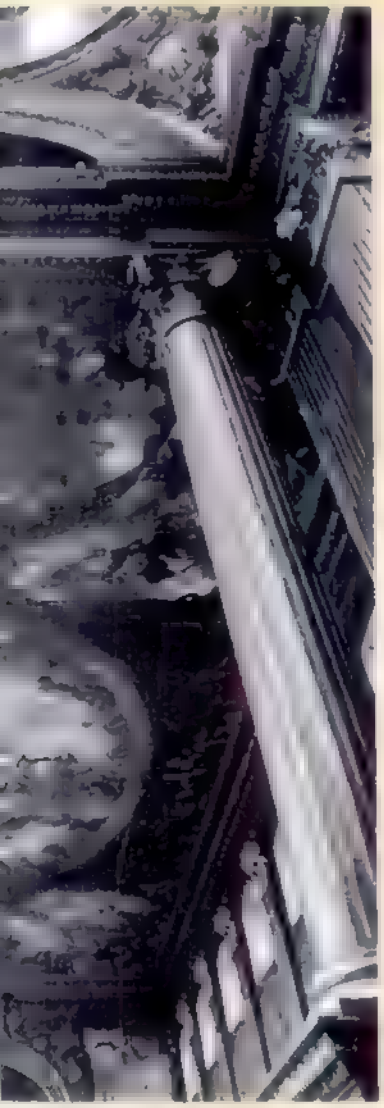
[illegible] and the modulation in the projected image is known as the modulation transfer factor and forms the basis of MTF calculations.

With a perfect lens none of the original subject contrast would be lost and the modulation in the projected image and the original subject would be identical. The modulation transfer factor would therefore be one and that is the maximum possible value. Unfortunately no lens can reach the ideal and all values for the modulation transfer factor are less than one.

For every lens through there is not just a single factor but a whole range. Factors can be measured for different subjects, different apertures, for the centre of the image and for the edge and for many other conditions. For the MTF it is the variation of the modulation transfer factor with the fineness of detail that is important. Indeed the MTF is simply a graph on which the modulation transfer factor is plotted against a measure of fineness of subject detail.

Spatial frequencies

As with resolution tests the fineness of subject detail for MTF tests is measured by the spatial frequency of line pairs (see page 171). However the lines on the test chart are not just black bars separated by white spaces. Instead the dark lines are faded very gradually into the



Michael Freeman

Typical MTF curves *Lens A gives high contrast with coarse detail but cannot resolve fine detail. Lens B gives generally lower contrast except at high spatial frequencies, where it is better than lens A*

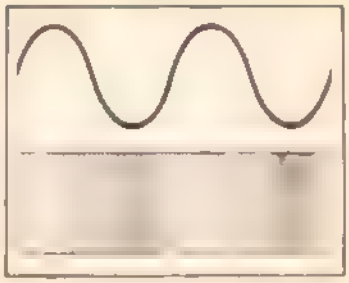
lighter spaces in between. The fading is very even and carefully controlled so that if the intensity of shading is measured at various points across the pattern of lines and plotted on a graph, the graph shows a sequence of symmetrical waves, referred to as *sine waves*.

Consequently, scientific wave terminology is used to describe the characteristics of the pattern. Fineness of detail is therefore described in terms of the *frequency* of dark lines on the chart. A line-pair—a single wave on the graph—is a *cycle* and so spatial frequencies are given in terms of the number of waves in a given space—that is, in cycles per millimetre. With coarse detail, there are few waves—few cycles—per millimetre: with fine detail, there are many waves — many cycles — per millimetre.

MTF curves

Modulation transfer factors—the loss of contrast in the projected image—can be worked out for various spatial frequencies and plotted on a graph. This graph is the MTF of the lens under test, and it is specific to that lens.

Nevertheless, it is noticeable that as the fineness of detail increases, so does the loss of contrast—as frequency increases, so the modulation falls. Eventually a point is reached where the contrast is so low that detail is lost. This, therefore, is the limit of resolving power of the lens. This limit is often



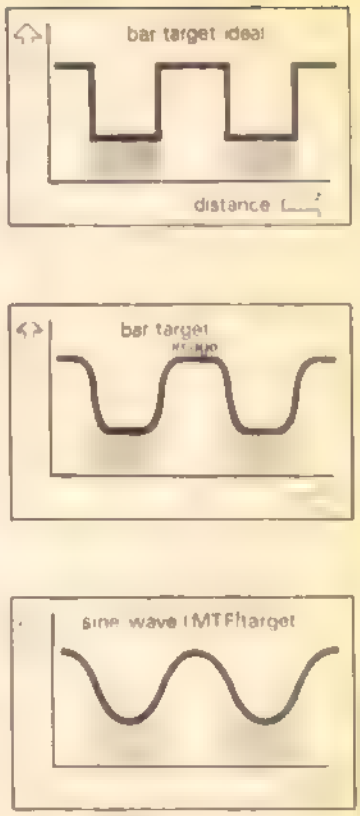
Sinusoidal target *MTF tests use a target with a gradual change from black to white. The target is oscillated to blur the black lines into a continuous tone*

taken to be the point where the modulation transfer factor has a value of 0.1 (sometimes stated as ten per cent).

Measuring MTF

Measuring MTF and producing MTF data requires equipment which is beyond the reach of most due to complexity and cost. A typical set-up uses a target at the focus of a collimator lens (see page 1075). This lens makes rays of light from any point in the subject parallel, so that the target is effectively at infinity. The target itself is not usually like a simple bar chart, but often consists of rotating optical gratings which generate all the spatial frequencies needed.

After passing through the collimator lens, the light is focused by the lens under test, and examined with an image analyzer. This is a sensitive photocell which scans and measures the image intensities at each frequency.



Paul Williams

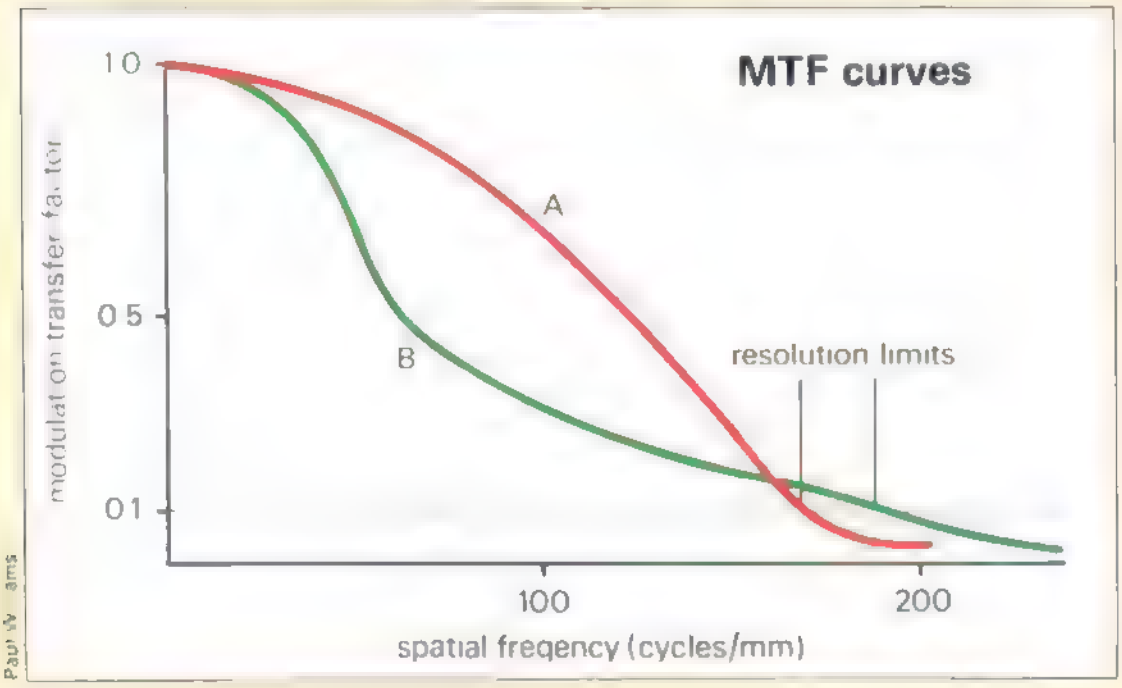
Graphs *showing the change in tone across various test targets. The middle graph shows how the lens softens the edges of the bars in the projected image*

Modulation is measured identically in both subject and image so that the modulation factor for each frequency can be found. With modern test apparatus the MTF curve is plotted automatically by a machine linked to the image analyzer.

Unfortunately, a single curve is inadequate, so a set is needed to give a fuller picture of behaviour. Curves are produced for on and off axis positions, with various wavelengths of light, and at different target orientations for each aperture setting of the lens.

A very useful property of MTF curves is that they can be combined or *cascaded* together, to produce a single curve. This is done by simply multiplying together the transfer factor values of each part of the system at each frequency to give the resultant MTF of the system.

MTF curves can be produced for other parts of the photographic system, such as the film and the enlarger. The resulting curves can then be cascaded to give an MTF for the whole system, showing the performance from subject to final image.



Paul Williams

Creative approach

Sunrise and sunset

Sunrises and sunsets can make many otherwise mundane scenes look spectacular, but you need imagination to create an eyecatching image and restraint to avoid the cliché

Few natural phenomena can result in such attractive skyscapes and sunrises. Both these [illegible] glowing colours and dramatic lighting that are instantly photographic and with the right exposure [illegible] give an attractive picture. Yet many sunset pictures are passed rather than exhilarating and to have a really dramatic sunset you must do more than merely point the camera at the sunset and press the button.

While beautiful sunsets are common enough in many parts of the world, really spectacular sunsets are comparatively rare. It needs a combination of circumstances to give the classic image of a fiery red sunset sky in a copper sky against clouds edged with gold and red.

As light and weather [illegible] are naturally a warmer colour than at other times of the day because at a low angle its rays have to travel further through the atmosphere, but for a really red sunset there must be an [illegible] in the atmosphere to help scatter the blue light — [illegible] very red in clear weather. The best sunset [illegible] when the weather [illegible] and when the [illegible] is often a hazy day.

[illegible] the most spectacular sunsets in the northern hemisphere were seen after the eruption of Mount Saint Helens in 1980 filled the atmosphere with volcanic dust which spread westwards from the volcano. On a more mundane level urban pollution, while generally undesirable, does help to produce some attractive sunsets and sunrises. If you live near a heavy industrial area, it is worth getting up early to catch the sun rising red behind the giant silhouettes of the factories.

Nevertheless, for the greatest spectacle clouds are important, preferably close to the horizon in interesting formations and at different heights. Clouds reflect and absorb the light, and the most interesting sunsets occur when there is a wide variety of clouds at the same time. In unsettled weather there usually cannot be often looks effective, particularly

Yvan Travert Bias Photo

Red sky *Colourful sunsets like this, with the sun below the cloud base, occur rarely and last for only a few minutes, so work quickly*

when combined with higher thin layers. Tropical sunsets appear so marvellous because the towering thunderheads of cloud that have built up during the afternoon heat are usually broken up after a short heavy storm and by sunset these show an intricate play of light to filter through. However, there is always the chance that the sun may sink behind a cloud bank before it reaches the horizon and not reappear before it sets. A sun heavily dimmed by cloud can actually appear more colourful on film than in reality, as the grey clouds often reproduce as blue or purple on film. Take the time to select a few of the best features of any particular sunset and concentrate on these. Choose the camera technique that will focus attention on these features.

For instance, under certain conditions the disc of the sun itself may be an interesting subject. In hazy weather, as with the tropical sunset, the disc appears to be enlarged and slightly patterned, and if the haze becomes thicker towards the horizon, the red sun may seem to sit in mid-air. In this case, use a telephoto lens to emphasize the effect.

You can also focus on the surrounding sky, taking either a general view that includes the sun, or a detail of the cloud formation, underlit, backlit or streaked with colour. You can create dramatic or unusual effects by emphasizing different areas of balance within the frame, for instance darker colours on top making the picture seem top heavy. If you isolate a small area of sky, you can obtain many interesting variations by using the lines and colours to create an abstract pattern.

Fritz Prenzel, Bruce Coleman Ltd

Sunrise in south Australia *Try using the colourful light of the low sun as a backlight to create strong foreground silhouettes*

Lake Diebo, Mali *A wide angle lens allows you to take in a wider scene for added interest and produces more than just a 'sunrise'*

Alternatively, you may want to treat sunrise or sunset as part of a landscape. In this case, the horizon and therefore the viewpoint becomes a major consideration. Contrast is always high at these times of day, and the [illegible] balance of contrast levels with subject matter is a delicate task. Details in the foreground are necessarily lost and become silhouetted against the sky. The brighter and less colourful a sunset or sunrise, the more pronounced the silhouette will be.

Silhouettes are a very useful [illegible] technique when you are photographing on the other hand [illegible] [illegible] shape [illegible] will [illegible] the sunset itself.

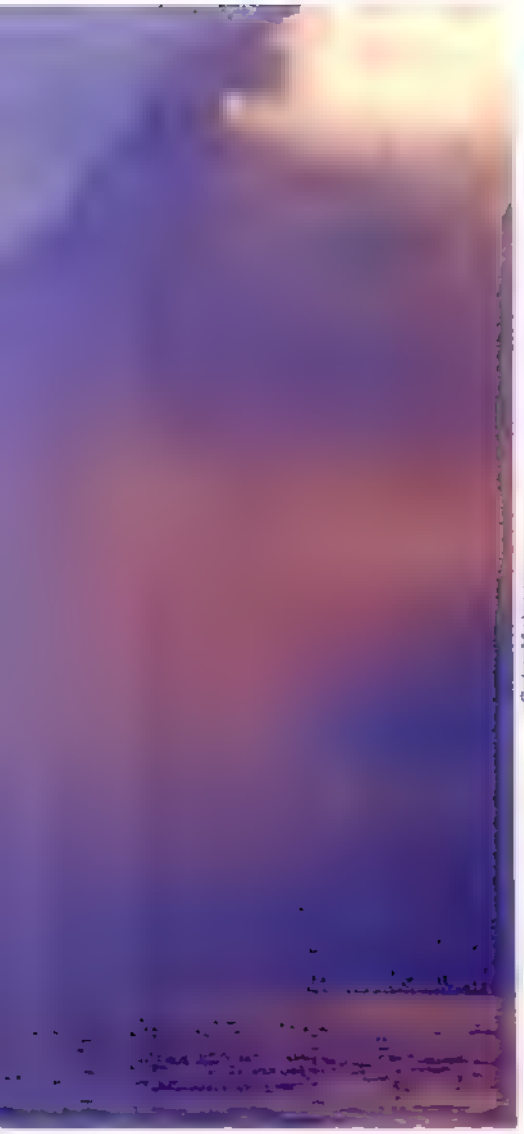
Creative approach

At sunset or sunrise it is usually worth choosing foreground details with interesting outlines. Set the exposure according to the effect you want. An average exposure may show some foreground detail, but will usually give weaker colours to the sky itself. An exposure based on the lighter areas of the sky will give deep, saturated colours and an intense silhouette. It is a mistake, however, to expose for the foreground as the brilliant sky colours will almost certainly be washed out. A graduated neutral filter can help to show both the sunset and the foreground however.

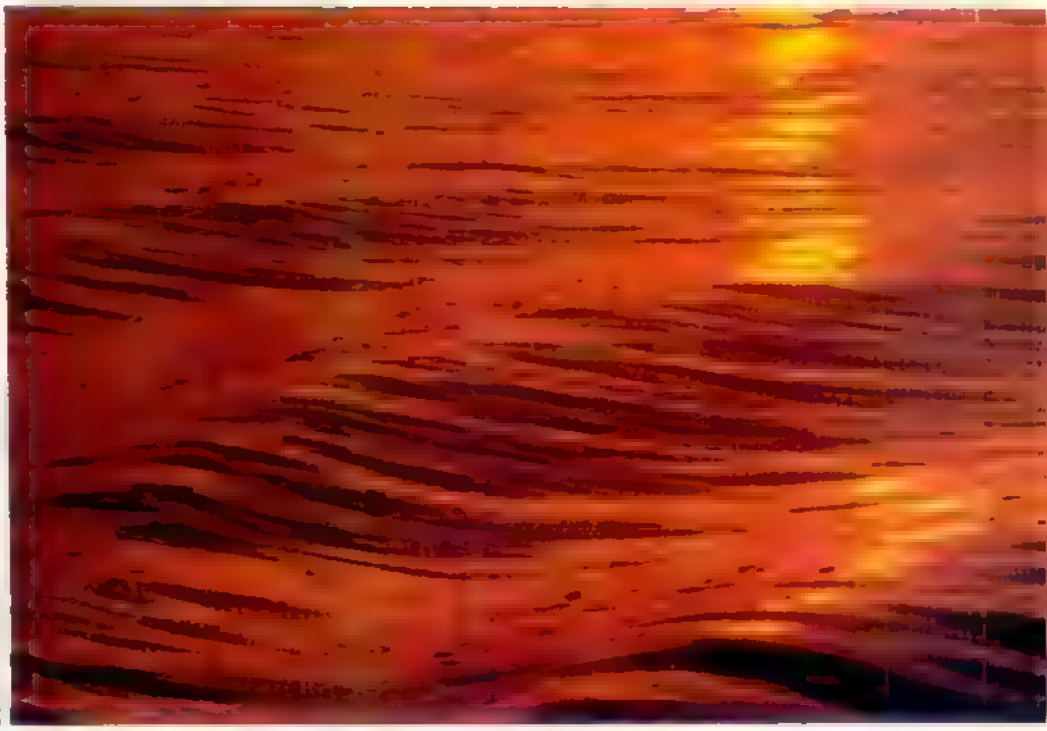
Foregrounds often pose a problem with sunset shots, particularly if the sky is not very interesting. Unless there is a fascinating silhouette, it is important to include some detail in the foreground to enliven the picture. The area immediately in front of the camera should therefore be fairly light in colour, otherwise it may be impossible to achieve the correct exposure—ideally it should be bright enough to balance the sky. A large expanse of water—the sea, for instance—that catches the reflection of the sky and adds to the changes is ideal. Mud flats or beaches serve a similar purpose, particularly when rounded off with a small silhouetted figure or boat.

Twilight offers very different possibilities. Just occasionally, when the weather conditions are right, there may be a vivid afterglow when the sun, no longer visible, lights up very high clouds in a spectacular way for a moment

Vautier de Nanxe

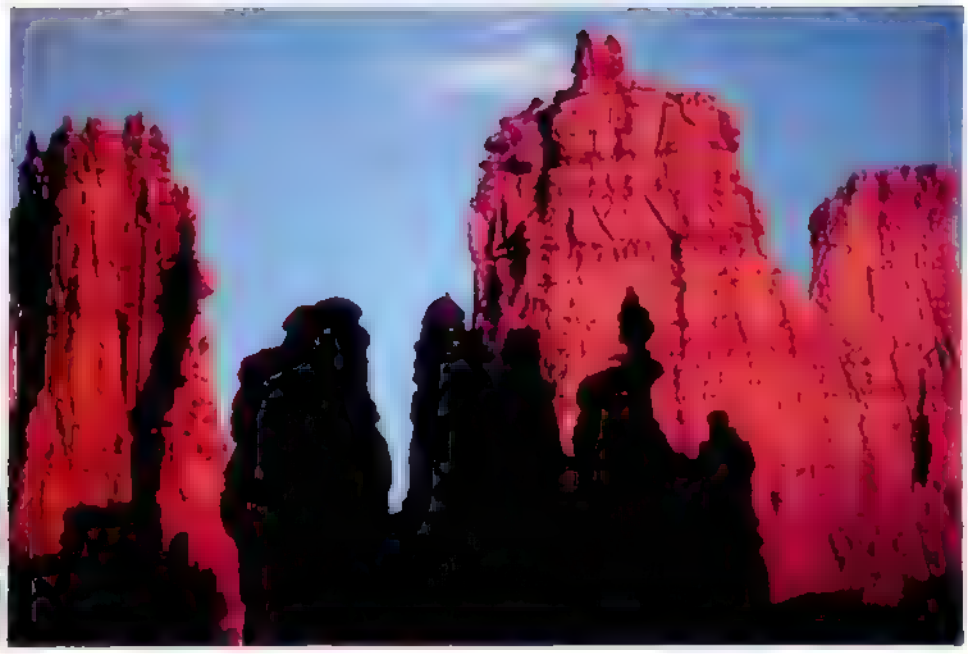


Colin Molyneux

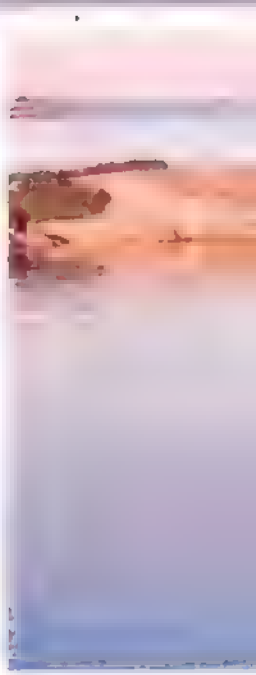


John de Visser

Malaysian fishermen *Brilliant colours are not essential for a dawn scene* **Death valley** *In the opposite direction to a sunset, you may find a patch of warm colour as the last rays of light stretch across the landscape* **Pastoral scene** *Instead of concentrating on the sky, the photographer has exposed this shot to feature the pastoral scene in the foreground.* **Waves** *Rather than including the sky itself, this shot combines its reflection with the water*



Arizona rocks *Warm light reflected in the rocks creates an attractive sunset shot—without the sun itself. The dark foreground shapes add extra effect*

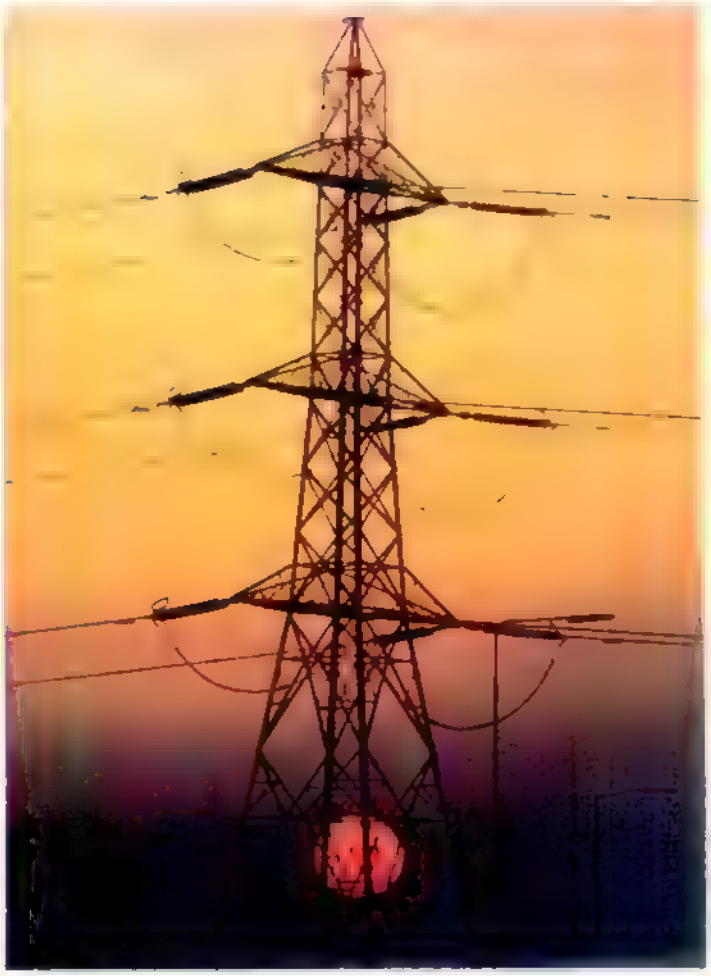


Sunlit building *Direct light can make your shots attractive, but it is equally effective to use the light as it is reflected from other subjects*

Dawn at 2000 metres *The graduated intensity of the blue sky and the dark, solid foreground create an attractive sunrise without dramatic colours*

Yachts in mist *This shot does not exploit the light usually associated with a sunrise, but gains atmosphere from the diffused, golden light caused by the mist*

David Gallant



Sun and pylon *For silhouette shots it is worth thinking of more unusual subjects to place in the foreground. A 300 mm lens is ideal for this purpose*

Landscape *For some shots, a low sun can be used to give extra qualities to a scene which already has enough interest to make an attractive photograph*

110 cameras

Genuine pocket cameras, 110s are popular as snapshot cameras or as 'notebooks' for the buff

Although the 35 mm format is still favourite for most serious amateur photographers, the 110 is becoming ever more popular for snapshots. Light, compact, easy to use and relatively inexpensive, the 110 is a genuine pocket camera and its popularity is easy to understand. For those who simply want shots to remember their holiday or snapshots of the family, it is ideal. But it can also make a useful pocket notebook for the serious photographer.

All film for the camera comes in simple, easy to load plastic cartridges. These can be quickly switched, so the camera with the maximum of film can be taken out when the film is finished without ever being rewound. And if you are prepared to waste frames, you can swap one film for another—say a slow film for a fast one—at any time. Naturally such a system is very popular with snapshooters who cannot be bothered with the more involved 35 mm loading procedure—and it is completely foolproof. The only disadvantage with the cartridge system is that the film cannot be pressed firmly up against the aperture with a pressure plate. This means that it cannot be used with fast lenses that have a small depth of focus.

The cameras are referred to as 110s not because of the size, as many people assume, but simply because Kodak used that number to identify the system when it was first introduced. Nevertheless, it is the small size that allows the camera to be so compact: each frame of 110 film measures only 13 × 17 mm.

Of course, although for ease of handling a small film is an advantage, it is the lens system that plays an important part in the quality of the photographs. In order to cram a small

Steady grip *The integral case of the Kodak Ektra 110 folds out to form a camera grip—a useful feature in a format prone to camera shake*
Compact 110? *Not all 110s are tiny—the sophisticated Minolta (below right), with its zoom lens, is larger than the 35 mm compact Olympus XA*

Dave King (gouaches courtesy of Agfa, Minolta, Kodak and Leitz)

110 selection *With the 110 format now rivalling 35 mm in popularity, the range is extensive, from the simple Brownie (top left) to the refined Pentax.* **Loading a 110** *involves simply slotting a cartridge into the camera back*

[illegible] camera lenses are around 24 mm, which is the equivalent of the standard 50 mm lens on a 35 mm format camera. Some cameras also have a telephoto lens which slides over to replace the standard lens as required. Several of these telephoto lenses must be focused, even though the prime lens is the fixed focus.

Some of the 110 systems are miniature SLRs complete with a full set of interchangeable lenses—wide angle, standard, telephoto and a tiny zoom lens with a range equivalent to 35 to 135 mm on a 35 mm camera. These SLR type cameras have reflex viewing and [illegible]

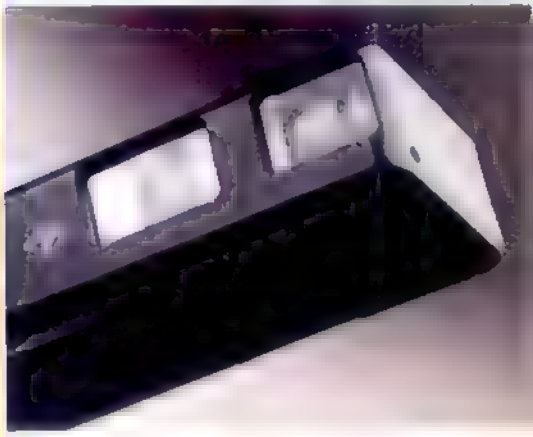
Dave King

[illegible] type were but [illegible] with the aid of [illegible] [illegible] It is [illegible] [illegible] As [illegible] [illegible] [illegible]

110 versus 35 mm *With negatives barely half the size, 110 film inevitably gives inferior results but on good quality film—here Kodachrome 64—results can be quite acceptable even when enlarged (left)*

Steve Mansfield

Underwater shots *to a depth of about 5 metres are possible with the Minolta Weathermatic. The yellow plastic cover also keeps out dirt, dust, rain and snow and the camera controls can be operated even in gloves*
Slide mounts *110 slides can be mounted either in small 3 × 3 cm mounts or in 5 × 5 cm mounts—35 mm size—that can be shown on a normal 35 mm projector*



Extra features *Basic 110s can only be used in good conditions, but the more expensive cameras have extra facilities that increase their versatility. Built-in flash, for instance, makes some kind of shot possible even in the darkest conditions. Even more useful are alternative shutter speeds—typically 1/50 and 1/100 second—that allow you to alter the exposure to suit the weather; the speed control is often marked in cloud or sun symbols rather than fractions of a second. Other features available include a telephoto lens that can be slid across to replace the standard lens, and variable focusing—with symbols to show focusing zones*

Dave King

Sophistication *The most expensive 110 outfits are complete camera systems. This one includes an autowinder, interchangeable lenses and filters, and a flashgun*

Colour combinations

With simple colour combination techniques, you can create entirely new images in the darkroom or transform two ordinary shots into one striking picture

Sam Haskins

[illegible]

Direct sandwiching

[illegible]

Making double exposures

[illegible]

Leaves and form *Combinations do not need to be complex to be effective—for this subtly attractive print, Sam Haskins, a master of colour combination effects, made a simple sandwich of two carefully chosen images*

[illegible] at least fairly [illegible].

[illegible] in your enlarger and project the second image on to a sheet of [illegible] paper [illegible] to your original [illegible] the outlines. The image [illegible] used for positioning the [illegible] up the second image. It is best to start with the image which is the [illegible] visually to the [illegible] when printing the original [illegible].

The next step is to make a series of test exposures to determine the correct printing time and filtration [illegible] for the [illegible]. As a consequence a [illegible] of dodging may be necessary. It is a good idea to use a smaller than normal aperture for the test and subsequent prints. However, as colour balance can be affected by stopping down, you should stick to whatever aperture you use for your tests when it comes to the main print. Do not, for instance, later choose to use a smaller aperture in order to obtain a larger printing time without first testing the effect on colour balance.

When you have produced a satisfactory test print, make a note of all the exposure details, and mark the position of the enlarger head if the second negative is being printed at a different magnification.

Expose the first negative by the second and use the tracing of the first image to align and size the second. Repeat the test procedure to establish the correct exposure and filtration for the second negative, keeping to the same aperture. Your processing must be consistent and you may find it better to wait until this point to process the first test print also. Make notes of all details relating to exposure and enlargement for the two negatives.

Fusing the images

Next, you have to prepare some black card masks. These are used for dodging [illegible] of the images so that both [illegible] together in the final combination. The masks can be prepared easily and quickly by lowering the enlarger head slightly and [illegible] from its nominal position and refocusing the image on the board to produce a slightly smaller image. Place some black card in the easel and trace off the outline of the dodge to be retained. Use a scalpel to cut neatly along the outline. Repeat the procedure for the second negative if necessary, and then reset the enlarger to its normal height.

When you make the exposures the

Tim Stephens

Floating castle *Two negatives, one black and white (above left), the other colour (left), were printed in turn on the same sheet of colour paper. The castle was given extra filtration during printing to create unreal colour*

[illegible]

[illegible]

[illegible]

Tim Stephens

[illegible] the first exposure lining up the mask for printing as soon as you can. This is the most difficult part, especially with short printing times—and you can see why it is advisable to use a small aperture for printing.

As the exposure proceeds move the mask backwards and forwards over an area slightly in excess of the area printed for the second image. The same applies for the second exposure. The purpose of overlapping the image areas in this way is to prevent a hard effect around each image in the combination.

After the first exposure the paper is removed and put safely away. In normal lighting reset the enlarger using the second negative. Adjust filtration and exposure settings as necessary and use the original tracing to accurately line up the easel. Tape this to the enlarger baseboard if there is any chance of it moving when the partly exposed sheet of paper is returned. In darkness return the partly exposed print, making sure that it is correctly oriented and properly seated in the making frame.

Hard-edge combinations

Except in combinations which [illegible] the slight halo effect along the border region, where two images fuse can be objectionable. You can make 'exact' combinations by constructing a printing jig as described on pages 362 to 363. An interlocking 'jigsaw puzzle' of card masks cut from a single sheet of card enables intricate combinations.

Because the glass platen of the jig tends to give prints a greenish cast, all tests and later prints must be made with it in position.

The jig is especially useful for special effect combinations of images and techniques. Instead of using card masks you could, for instance, use a series of positive and negative lith images prepared beforehand (see pages 914 to 917).

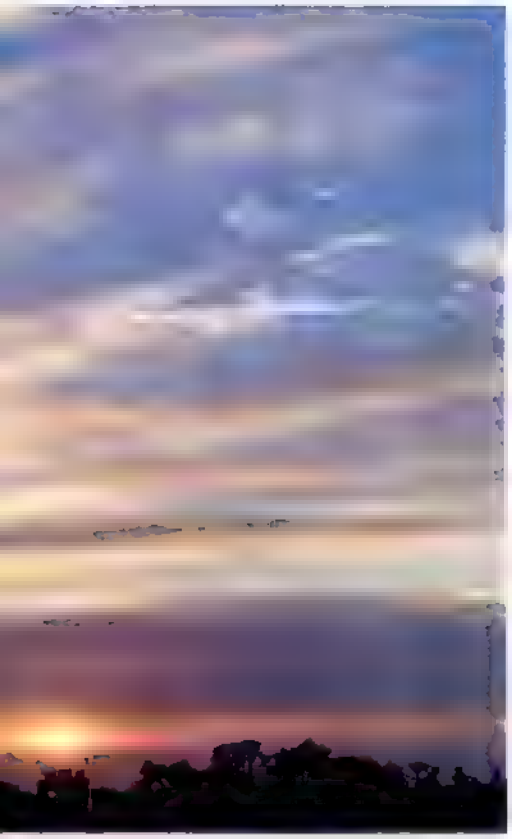
The first colour negative of your combination could be printed through the positive lith image mask (whose shadow is slightly out of focus on the easel). Then the second colour negative could be printed through the negative lith image. The result would be a perfect merging of one colour image with another, the shape being dictated by the lith image.

It follows that these lith film masks could be produced specifically to replace card masks in any combination printing sequence where precise and unobtrusive merging of detail was required.

One problem is to ensure that the positive and negative masks fall in exact register as one lith image replaces the other. For simple shapes you may find that a simple overlap system is adequate. Align the positive and negative sheets, and carefully tape each to a different side of the printing jig, in a way that enables the used sheet to hinge out of the way. If necessary, use a thin sheet of glass to sandwich the film against the

Ruins at sunset *Two pleasant but dull slides can be combined to create a strong image. A straight shot of the ruins is scenic but, with a modern fence in the foreground, has little atmosphere (above left). The sunset, on the other hand, is pretty, but lacks any real centre of interest. Two*

Tim Stephens



Tim Stephens

alternative combinations (below) show the improvements that can be made. For each, the sunset sky was inverted and extra clouds have been added by dodging, which also helps to hide the edges of the two images. One was printed with natural colour (left), the other was filtered

glass platen during exposure As this will affect filtration and the image formation, it must be left in position for the test and main prints

Where accurate registration is important, you may have to use a pin bar on the edge of the glass platen, punching both sheets of film. For registration details see page 927

Combinations need not be restricted to just colour negatives. Colour with black and white and negatives with slides provide some interesting combinations—and you can go further by printing on reversal material when your ideas begin to run out

Reversal material such as Cibachrome offers a particularly effective yet simple technique for combination printing When you place a simple mask on reversal paper and overexpose the print, the area that has been shaded can be used for a subsequent image. If everywhere but the masked area is greatly overexposed, any subsequent transparency image will only print in the space left by the mask

As the mask could take the form of a photogram (produced by objects placed on the platen of a jig, or directly on the print surface) many interesting effects are possible if card masks and lith overlays prove too complicated

More than anything, colour combination printing requires meticulous care and a critical attitude—a willingness to abandon combinations that do not work, or make adjustments until the effect is just right. Given this, you should be able to make high quality combination prints

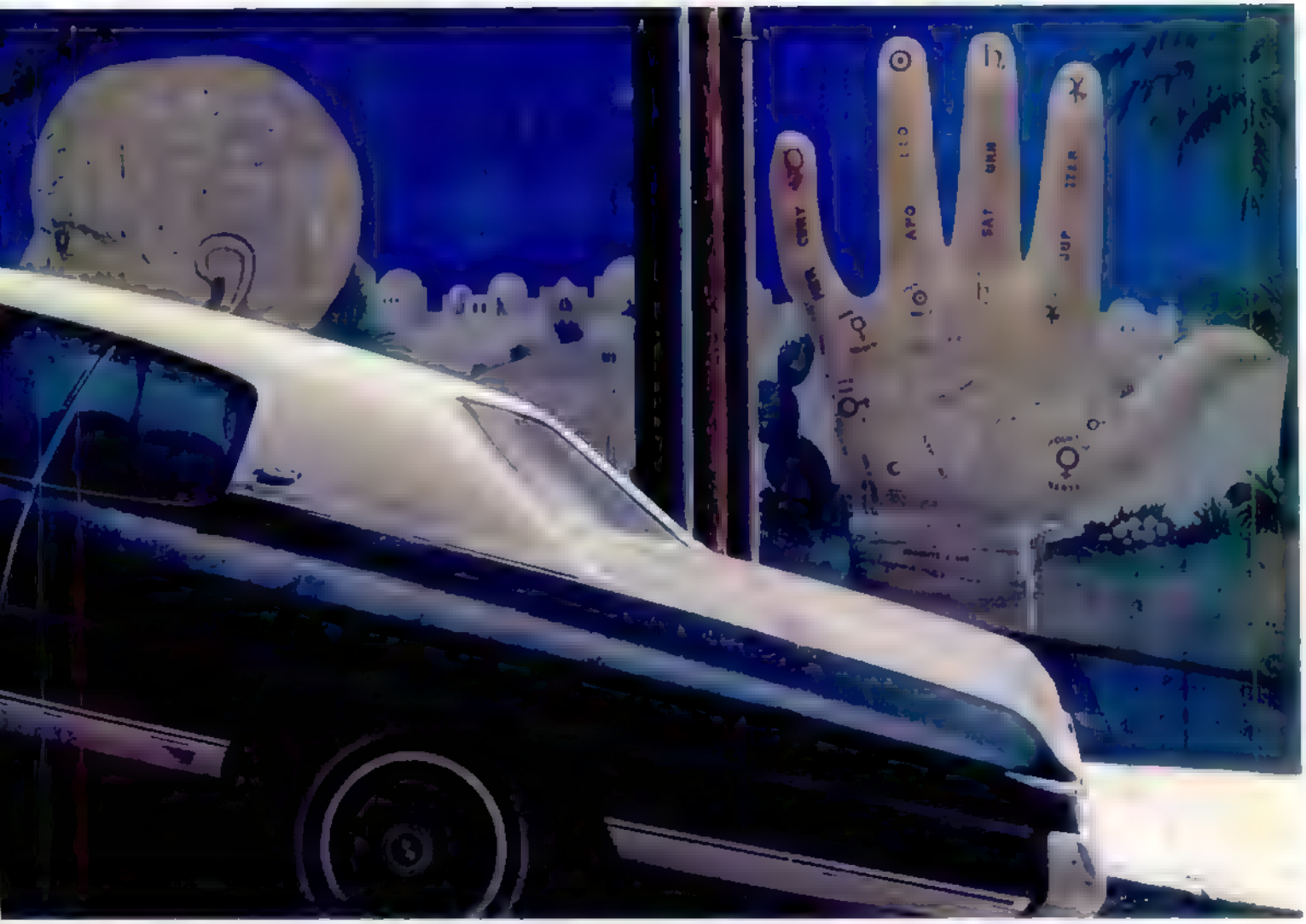
Choosing a subject

Castles in the air are easily created using the techniques described in this article. But there are many other possibilities for creating unusual effects, limited only by your imagination—and your collection of images

One approach—perhaps the easiest for the beginner—is to use soft-edged areas of images to create a dreamlike or fantasy element. Such an effect can be used to imply someone's thoughts, or their true nature, when used in conjunction with a portrait

The sandwiching method requires carefully selected transparencies or negatives. The Sam Haskins picture of leaves used on page 1112 is an example. The viewer is forced to look at the image carefully to find the various elements, yet the overall effect is well designed and not confused. This is an important requirement for combined images—the viewer should be intrigued, and maybe fooled, but not overwhelmed unless you are consciously setting out for such an effect

Why create such images in the first place ? Many of Haskins' pictures are commissioned for calendars. Another major use of combination printing is on the covers of records or paperbacks. For some imaginative and skilful darkroom experts, what began as an entertainment has now become a lucrative and demanding profession



World of photography

Milan Horacek

Self-exiled from Czechoslovakia, Milan Horacek settled in Germany where he studied photography. As a photojournalist he now travels widely

Head and hand *Stark juxtaposition of a modern car with an old fashioned mural creates a striking surreal effect*

Palms and jet *Another example of placing two unrelated objects in an unusual composition of contrast*

Grass fire *Part of Horacek's story on the Sudan. He found it one of the most difficult assignments he has had to do*

Milan Hogrzek

Cyclists' knees *Details such as these give a clear idea of the stresses and dangers involved in long distance racing. These riders took part in the arduous Giro d'Italia*

Savings bank *The sign of this bank in Tucson, Arizona highlights the effect of the town's instant architecture and stresses its temporary look*

Milan Horacek

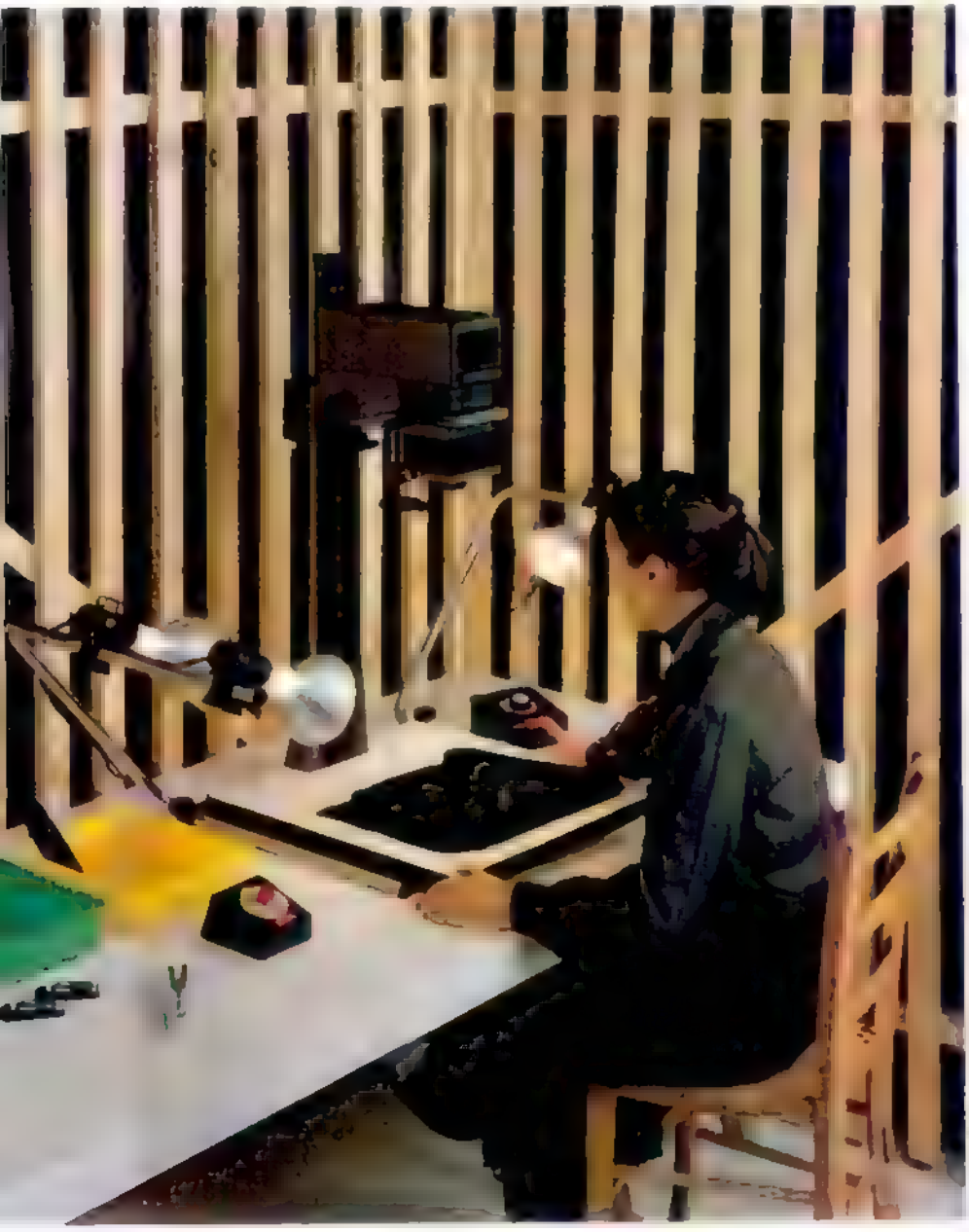
Wildworld burlesque *A long exposure has the effect of isolating the people who are sitting together on the bench*

Swimmers *Horacek studied a tribe affected by the building of a new canal fed by the Nile*

Bicycle race *Horacek took many of his photos of the race while riding pillion on a motorcycle. He was interested in covering the race from every angle, not just in snapping the winners at the finishing line and in conveying the feel of the entire bicycle race*

Copying with an enlarger

Your enlarger has most of the features of a copying camera. With a little ingenuity, you can make high quality copies without leaving your darkroom



Courtesy Durst

Enlarger with lights *Proper copying lights evenly illuminate your subject. With this set-up, both small objects and flat originals can be photographed*

Projecting on to film

The enlarger as a camera

Almost any enlarger can be used as a copying camera. Indeed, a number of enlargers are specially designed for conversion into copying cameras and there are various copying accessories available, a special 35 mm film cassette with a built-in shutter and film cutter is available for Meopta Opemus enlargers for example.

With enlargers designed for copying work you can see the image projected on to the film carrier directly and focusing is simple. Most enlargers however must be focused using the following procedure.

Place a spare negative in the carrier and mask it off carefully with the negative carrier masks to ensure that the whole image is well within the covering power of the lens—the masks must be kept in place as the copy film is inserted later to ensure the correct sized copy.

Compose and focus the projected image of the spare negative to give an exact correspondence exactly with the original to be copied. If the original is flat, focus the image on a sheet of white paper. This must later be replaced by the original. The focus point of three dimensional objects can be estimated by raising the easel slightly above the baseboard.

When you have correctly focused the enlarger, lock the enlarger head in position on the column, stop the lens down to its working aperture and carefully remove the negative carrier. Take special precautions not to knock or otherwise disturb the lens panel during this and subsequent stages. On some enlargers it may be possible to lock or at least temporarily tighten the focusing mount in the required position.

You may find it more convenient not to remove the carrier at all once the correct focus has been obtained—simply close up the top part of the carrier to remove the focused negative and replace this under safe lighting or in darkness with a piece of previously prepared cut film.

You must make sure that the only light that reaches the film in the negative carrier comes from the object being photographed. To do this take light excluding flaps around the negative carrier so that you can still read the film easily. It may be necessary to tape over the light leaks that the manufacturer provides to protect the enlarger cooling slots if more than necessary so that you can still use the enlarger lamp for focusing.

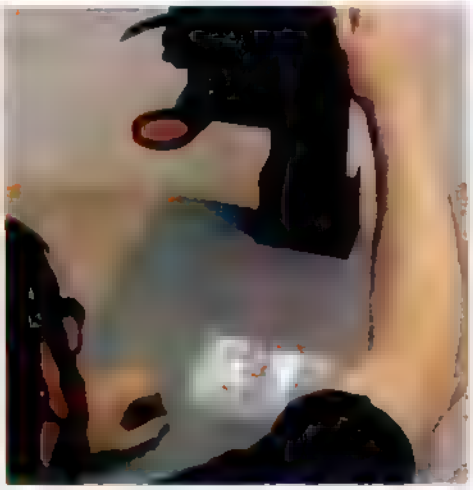
Of course for the copy photograph to be taken the original must be properly lit. Lighting arrangements are explained fully on pages 944 to 947 but organizing a proper lighting can be an annoying interruption to your darkroom work and you may find it more convenient to work in the dark and for exposure literally paint a subject with light from a single lamp. Alternatively you could use a succession of individual flashes from a flashgun each from a different angle.

Remember to keep the lighting at 45° to and some distance from the surface of the original. Make tests to determine both the distance and the time a lamp should be used. If you are using a flashgun try out various power settings and a number of flashes. You may for instance find a set of low power flashes around the subject gives better and more consistent results than one high-power flash on each side.

If the original needs to be backlit any simple light box with suitable lighting can be used. Another method is to place the original on a piece of flashed opal glass or plastic behind which a lamp or better still an electronic flash is positioned. Flash has the advantage of being consistent, it generates no heat and it is suitable for black and white and daylight-type colour films. Be sure to tape the film to the glass if it is uncurled so that it is held flat or weigh it down with another piece of glass.

To make the copy clean the negative carrier with an antistatic cloth and blower brush to remove all dust and marks from the glass. Under safe-lighting or in darkness—depending on what film you use for the copy—place a large piece of cut sheet film, emulsion side down, in the carrier—with an oversized piece of film, there is less chance of damage to the image during processing. Then carefully replace the carrier in the enlarger head. Normally a small

Three copying techniques



Copying on sheet film 1 *The first step in making enlarged copies on sheet film is to project the image on to the enlarger baseboard. Set the desired size of the enlargement, and adjust for focus. Depth of focus is sufficient for accurate focusing on the baseboard*

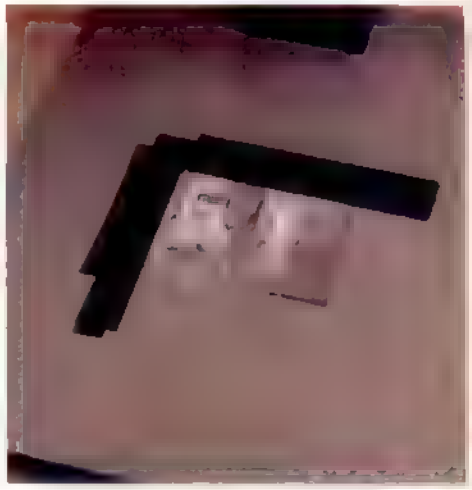
2 Once you have decided how large to make the copy, tape suitable strips of black card to the baseboard to form stops against which you can register the piece of film. Be sure to tape the strips down well at the ends so the film cannot slip under

Copying on Polaroid 1 *Type 665 Polaroid peel-apart film gives a print and a negative 30 seconds after processing begins. Use an old film pack with a sheet of white paper inserted in the aperture for focusing and framing under the enlarger*

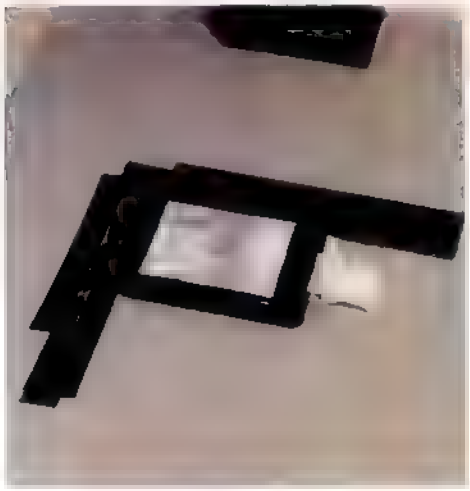
2 When you have focused the image on the old film pack, which should be registered against cardboard strips in the same way as for copying on film, take a fresh pack of film out of your Polaroid camera in total darkness. Put the full film pack in position

3 *In total darkness (if you are using panchromatic film) place a sheet of film against your taped-down stops. If the code notch cut in the edge of the film is at the bottom left, the sheet is emulsion-side up. To prevent marks, make sure your hands are dry*

4 *Use a sheet of black card to make a test strip. The technique is the same as for ordinary test strip making, except that exposure time is shorter than for black and white paper. When using a white baseboard, place black paper under the film to stop halation*



5 *Once you have found the correct exposure time, make the print. The sheet of film can be processed in a colour print drum without risk of fogging. Wash the sheet and then rinse it briefly in wetting agent Hang it up to dry in a dust-free place*



3 *After making the test strip, you can make an exposure. Replace the film pack in the camera or Polaroid film back, making sure that one white tab protrudes. To process the film, simply pull the tabs in the normal way for Polaroid pack film materials*

Using the enlarger as a camera 1 *The main problem with most enlargers when using them as cameras is light leakage. This is usually most significant around the negative carrier. To exclude light, use opaque tape to attach flaps of black paper around the carrier*

2 *Objects on the baseboard can be lit by making multiple exposures with an electronic flash. Carefully direct the flash towards the subject to give even exposure as you press the open flash button, then repeat the procedure from the other side of the subject*

Jon Bouchier/enlarger courtesy of Philips

amount of vibration is allowable providing this does not cause the lens focus mechanism to slip.

Determining exposure

Exposure must inevitably be a matter of trial and error at first but by carefully noting results you should eventually be able to eliminate most of the waste. The secret is to keep your lighting and exposure conditions constant. Stick to the same aperture you normally use for printing, and use your enlarger at the same magnification for as much of your work as possible.

If you are using tungsten light, time exposures in the order of several seconds are necessary for slow speed film. Exposures can be made simply by switching the light on and off. For even lighting with a single lamp, make part of the overall exposure from one side of the baseboard and subject, and the remaining exposure from the other—remembering to keep the lighting at 45 to the surface (see page 945).

Flash exposures are easier to estimate. You can sometimes use the flashgun's own computer to regulate the amount of exposure which is given. A low output setting enables multiple flash exposures where this is preferable to a single flash exposure.

If flash is used, ensure that the baseboard is completely illuminated—you literally have to sight the flashgun to do this. Move further away and use more flashes if even coverage is required.

Small pieces of film are not too difficult to process in dishes but be careful not to scratch the emulsion. Cut film-holders may help minimize the risk of scratching. While processing, wear rubber gloves and carefully support the film beneath the surface of the processing solution but away from the bottom of the dish. In this way, films can be kept [illegible] scratch free. You may find conventional film clips attached on each side of the sheet of film, a suitable alternative method of keeping the film clear of the dish bottom. Nevertheless, handling at the edges is inevitable and this is the reason for using oversize pieces of film.

Assignment

OCEAN YACHT

Sailing is an excellent sport to combine with an interest in photography. Here leading sailing photographer Alastair Black shows that there is more than one way to capture the atmosphere of a yachting race

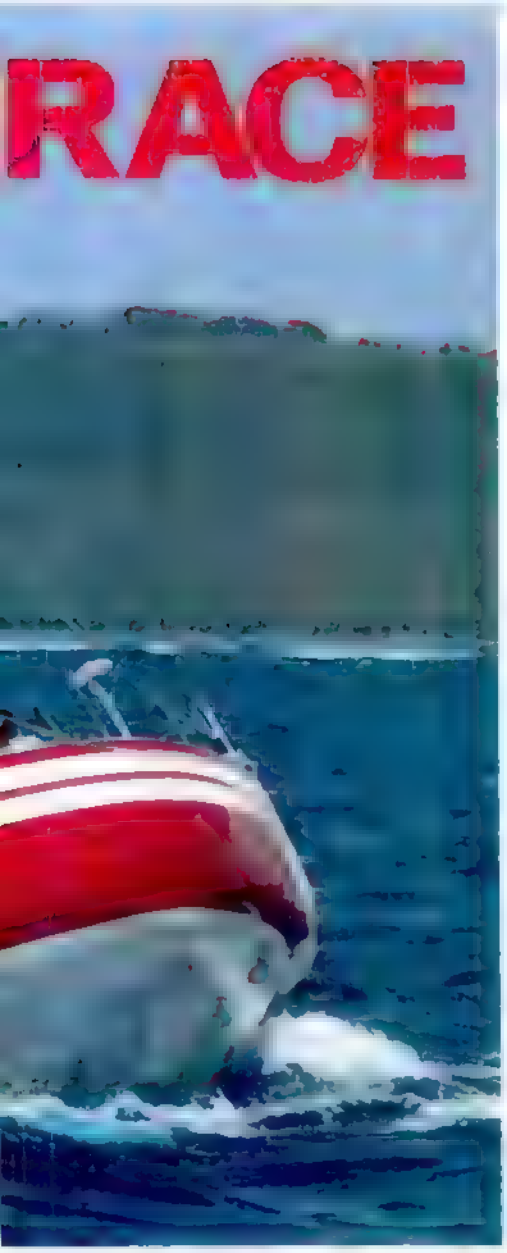
Alastair Black is a leading specialist in this type of photography and has led the way in finding new, exciting views of yachting (see pages 1[illegible] to 1[illegible]). We wanted to see how he approached a particular event—Antigua Race Week—and what could be done from various different viewpoints.

Many of Alastair's most exciting shots of the race were taken from a powerboat. With careful manoeuvres the boat was positioned so that there was a real sense of involvement in the photographs.

A great problem involved in taking photographs from a boat is that of dealing with the spray which soaks everything on board. Alastair has now developed a technique for keeping his back to the spray until the moment he is ready to shoot, while also protecting his equipment inside his anorak. All lenses are protected by skylight filters but these frequently have to be wiped clear of salty water.

Whether shooting from a power boat or from a competing yacht, Alastair pointed out that another difficulty is

RACE



Alastair Black

keeping the horizon level in the frame. The shot of the activity on board a racing yacht shows the sort of conditions which prevail when a vessel is heeled at a 45° angle. Unless a conscious effort is made to do this you can end up with awkward looking results. Furthermore, if you do use automatic cameras for this sort of photography you must use the manual setting, otherwise the automatic exposure will be made for the white areas of bright spray and the rest of the image will be underexposed.

Recently Alastair has changed his favourite lenses for sailing photography. I used to use an 85-205 Nikkor zoom for much of this sort of work, but I found that they are slower to use and in situations when I needed to react quickly, I was

Red and white spinnaker *To position yourself correctly requires a sound knowledge of sailing. 80-200 zoom, 1/500 second at f/8.* **Kialoa** *Alastair waited for a foreground wave and used a low angle for more drama.* **Beach scene** *The yachts on the horizon are used as secondary subjects which are combined with the view of the island paradise. 20 mm lens.* **Group of yachts** *The 105 mm lens filled the frame with the competing yachts*

[illegible] that a number of unsharp results [illegible] I use an extra body so that I have [illegible] fitted with a [illegible] mm f/2.5 and one with a [illegible] mm f/2.8

[illegible] piece of equipment Alastair found useful in Antigua was his Nikonos [illegible] water camera. He prefers the [illegible] types—the Nikonos III—[illegible] this camera for shooting the spinnaker flying from the water—the [illegible] he produces very exciting shots but you have to be careful not to get [illegible] wet.

For the aerial shots Alastair had the planes passenger door removed so that he had an unobstructed view. He varied the height for different effects. However, without a door Alastair points out that you have to be careful to keep the lens out of the current of air. 'If I use my FEs I [illegible] have to keep them on manual to be sure that they will expose for the yachts rather than the bright water around them. Most of the aerial shots were taken at [illegible] second so there was no chance that the vibration of the aircraft would cause camera shake.

[illegible] show the wide range of [illegible] that can be obtained at a yacht [illegible] They also show that for really [illegible] shots you really have to have [illegible] right in the thick of it.

Action on deck *Soaking wet and crouched in the bow of a yacht, Alastair used a 35 mm lens to fill the frame with the exhilarating action* **Bird's eye view** *This shot from a light aircraft exploits the colour of the spinnaker*

Flower *It is often hard to link the yachts with the locality. Even though the background is out of focus, the yacht is still recognizable*

High flying *This viewpoint contrasts with the sea level shots. Such an angle simplifies the subject, turning the yachts into abstract shapes*

Spinnaker flying *From the water, Alastair used a Nikonos to shoot crewmembers and the spinnakers flying in the strong wind*

Photographs in print

Reproducing pictures in books and magazines is not the same as making photographic prints. The image must be broken down in such a way that the tones and colours can be printed using a limited range of inks

Image with only the cyan separation printed

Magenta separation added

In this very image-conscious world, photographs confront us everywhere we look, yet very rarely do we see 'the real thing'—nearly all are reproductions in print. It is only occasionally that the work of some professionals appears on film or photographic paper. Not surprisingly, it is the ambition of many amateur photographers to see their pictures in print as well. But just what is involved in reproducing a photograph in printer's ink?

In the early years of photography, reproducing pictures was difficult. Pictures shot for newspapers or for magazines were copied by engravers. And in a few rare cases actual prints were pasted into books. But now there are many methods of reproducing photographs

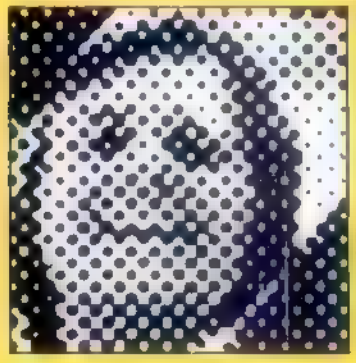
One of the main problems to overcome is the fact that a photograph has a complete range of tones and colours—it would be impossible to provide a different ink for each tone and for each colour For reproduction, therefore, printers have to use techniques that can give the same range of tones and colours with just a few inks

Tone reproduction

A complete range of tones is achieved by using an optical illusion. Examine a newspaper picture very closely You will see that the printed picture is made up not from emulsion grains but thousands of dots of black ink Variations in tone are achieved by varying the size of the dots. Dark tones are recorded as large dots that often merge together. Grey tones contain medium sized dots. And highlights are shown by tiny dots, or even none at all. When viewed from the right distance, the variation in the amount of black ink in each tonal area gives an illusion of the correct tone

The first step in reproducing a photograph, therefore, is to break it down into a collection of dots. This is normally done by rephotographing the picture through a *half-tone* screen on to lith film. A half-tone screen generally has a grid made by ruling two sets of parallel lines at 90° to each other. Each little square on the grid behaves as a small pinhole camera and produces a squarish dot on the lith film The size of this dot depends on how much exposure it receives and this of course depends on the tone in that area in the original picture

The number of screen rulings on the half-tone screen—and therefore the number of dots on the film—varies according to the type of printing process to be used and the quality of the paper. Like fine grain film, a large number of rulings, giving more, but smaller dots, allows finer detail to be reproduced and gives better quality. High quality reproduction demands 60 to 120 lines per centimetre (150 to 300 per inch) while magazines and books generally use 48 to 60 lines (120 to 150 per inch). Newspapers, however, use as few as 24 to 44 lines per centimetre (60 to 110 lines per inch) because the quality of the paper is not good enough to reproduce a fine screen. Large posters are often rephotographed using screens of 20 to 60 lines (50–150) but the half-tone picture is later enlarged so that the number of lines per centimetre is very low



courtesy of The London College of Printing

Colour reproduction

A similar process is employed in reproducing colour. But, in addition to breaking down the image into dots, the original must also be reduced to a basic set of colours The principle here is the same as with colour photographic processes, particularly colour printing. It is the *subtractive* method (see page 590) using three main colours

—yellow, magenta and cyan.

For reproduction *separation negatives* are made by repho-tographing the original three times on to sheets of black and white film using half-tone screens. Each exposure is made through a different filter. The colours of the filters are the primary ones—red, blue and green.

The separations are then contact printed to make film positives, and these are used to transfer the image on to printing plates by a variety of mechanical and chemical methods. In this way three printing plates are prepared. The plate which was derived from the green separation is used to print magenta ink. The red plate prints cyan ink and the blue plate provides the yellow component.

The inks are semi-transparent. They are deposited on a white paper base and each colour absorbs some of the light which falls on it. Theoretically, when all the inks are printed on the same spot, the result should be black. However, one defect of the colour-ink printing process is that an insufficient black is formed by the coloured inks. So a *black-printer* is normally made and printed in black ink, reinforcing the tones already created by the coloured dots.

To understand this process, consider an area of an original photograph that is red. This is photographed through primary filters onto three sheets of black and white film. Only the red filter transmits red light, so the red filter negative is black, the green and blue negatives are clear. Positives are then made from the negatives, so that the red filter positive is clear, and the other two are black.

The printing plates made from the positives are then printed in succession and registered on the paper. The red separation plate (with cyan ink) does not print in the area that represents red. The other two plates do, however, and so print yellow and magenta dots which combine to form red.

The half-tone negatives used to be produced using a special camera—known as a *process camera*—so that they could be made to the size required for the final print. Now this has largely been replaced by electronic scanners. Films or unmounted prints are fixed to the outside of a drum which revolves, and the image is scanned using a thin beam of light such as a laser. According to the instructions fed to the machine's computer, the four colour printer separations (red, blue, green and black) are printed on to film in half-tone, with the appropriate degree of enlargement. The machine is set to allow for the printing process which is to be used, the type of printing paper, the printing inks, and any special instructions.

Printing processes

Once the half-tone separations have been made, a printing method can be chosen. The three main methods used for magazines and so on are *letterpress*, *photogravure* and *lithography*. They all use a half-tone method for middle tones, although line information [illegible] such as [illegible] printed with [illegible] as a solid [illegible]

Letterpress [illegible] to gravure [illegible] printing method. With letterpress (which [illegible] paper [illegible] the [illegible] printing [illegible]

[illegible] sists of the [illegible] dots. With gravure the areas corresponding to the tones are etched into the metal. Ink is applied to the plate and then scraped off the [illegible] surface. The remaining ink in the depressions of the plate then forms the final image when paper is pressed onto the plate. Gravure is noted for the high quality of reproduction possible, but is too expensive for most purposes.

Lithography is the process used by many printers including this publication. Halftone dots are used again but the surface of the printing plate is flat with no raised or etched areas. The image areas (the dots) are grease accepting. The plate is dampened with water, then rolled over with an ink which only takes [illegible] the image areas. Highlights are very well reproduced [illegible] but lithography [illegible] a very fast [illegible]

Yellow separation added to give the full range of colours

Timothy Beddow

Black printer added to give a full range of tones

Advertising Arts

***Print processes** Letterpress and lithography produce tones simply by a variety of dot sizes. With gravure, it is the amount of ink carried by each depression which is important*

***Dot screen** Progressive enlargements of a half-tone picture show how the image is broken down into dots, some of which merge together*

Trevor Wood

Vautier, de Nanxe

Shops and markets

From the stark, high tech modern supermarket to the quaint old backstreet bookshop or the bustle of a street-trader's stall, shops and markets offer a wealth of interesting material on almost everyone's doorstep

On foreign trips market places act as a magnet for the photographer. With all their bustle and colour they seem to give the perfect opportunity for capturing the flavour of the place. Yet when they are at home photographers tend to ignore the local shops and markets. This is a pity because the scope for candid shots, still lifes, abstracts and many other types of photograph is tremendous even in the most ordinary shopping centre.

Indeed, there is such a profusion of colour and activity that it is easy to lose sight of the photographic potential.

It is therefore important to decide what interests you in the subject and then clarify what you want to achieve. Look for a theme, such as fruit or abstracts, so that it is easier to be selective. It may even be worth visiting your local shopping centre without a camera simply to look at the subject matter available and look for a good theme before starting.

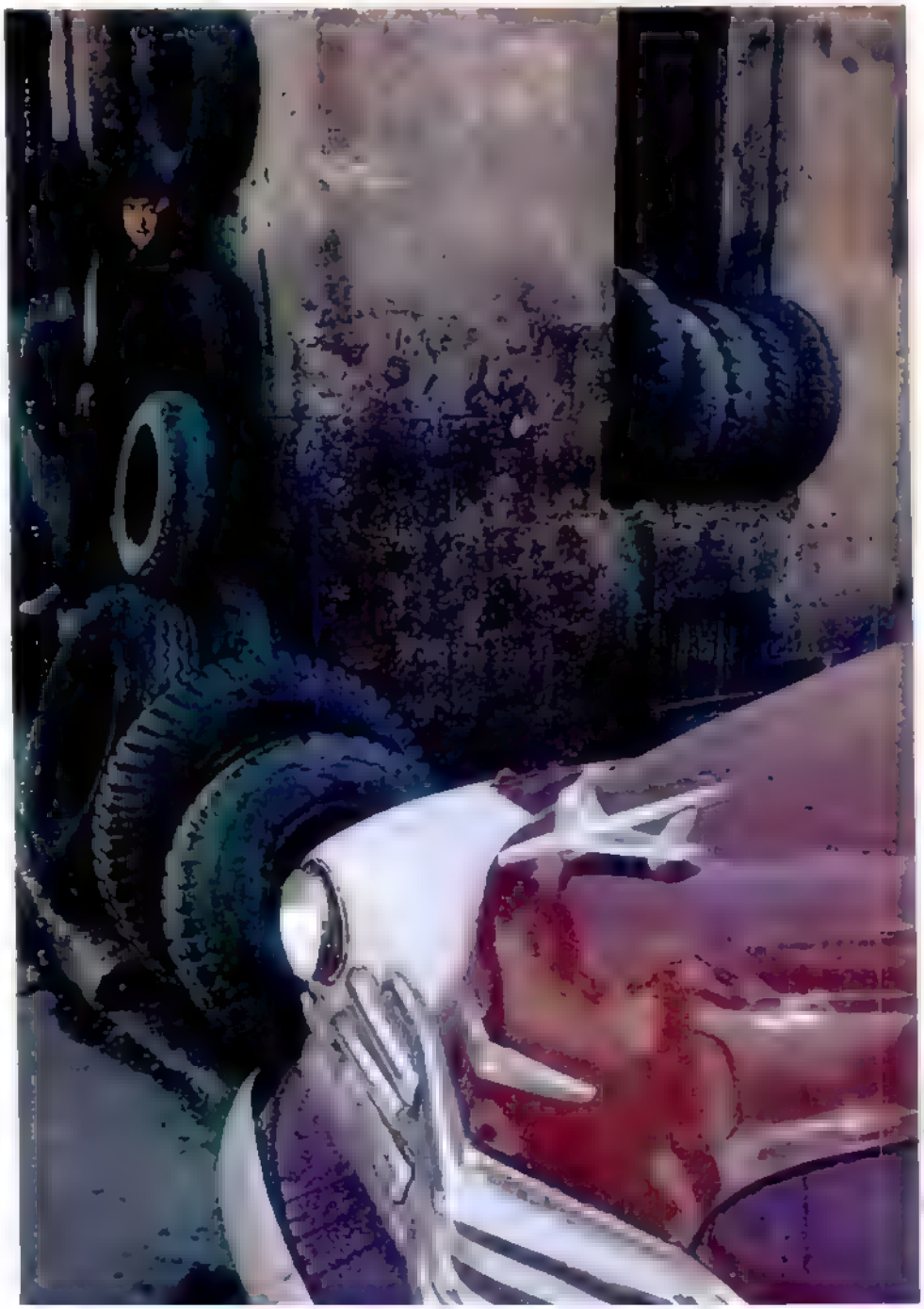
It is often most satisfying to tackle a theme by setting yourself a project. For example, you could spend a day following the activities of one or two stalls in a market. Atmospheric pictures of the empty stalls in the dawn light could be followed by shots of the stallholders setting out their wares nearly at the beginning of the working day. Both of these photographs can be contrasted with shots of the scenes of disarray at the end of the day.

In between these times you may catch many amusing and candid pictures of people buying and selling. Persuasion and argument lead to a sale or sometimes to disappointment. A friendly rivalry usually exists between market people who tend to be extrovert and expressive. Watch out for humorous gestures as they haggle over prices.

Try to choose a bright but overcast day when contrast is not too great and there is a good tonal range. Bright sunlight causing deep shadows under the awnings can produce exposure problems, and colours can look more interesting in softer light.

Alternatively, you could concentrate on still life subjects rather than people. Most markets and shops are crammed full of fascinating subjects for still life studies. Some of them, even themselves particularly well to certain aspects of still life. A cheese market, for example, is an ideal place to concern yourself with shapes and patterns, and close-up pictures could reveal these as abstract designs.

John Goldblatt/Vision International



George Wright

Café *Try recording those decorative shop styles which may soon vanish*
Mannequins *Interesting reflections can be juxtaposed with a window display.*
Night scene *A panoramic camera helps show the full flavour of a street*
Jewish bakery *If the shop's goods are attractive, place them in the foreground with the subject behind*
Garage *A bright car brings a touch of colour to the dull stack of tyres*

Barber *This scene in Alleppo, Syria, novel to some outside eyes, makes an interesting photographic record*
Looking for a bargain *People searching through sales goods make excellent, uninhibited candid subjects*

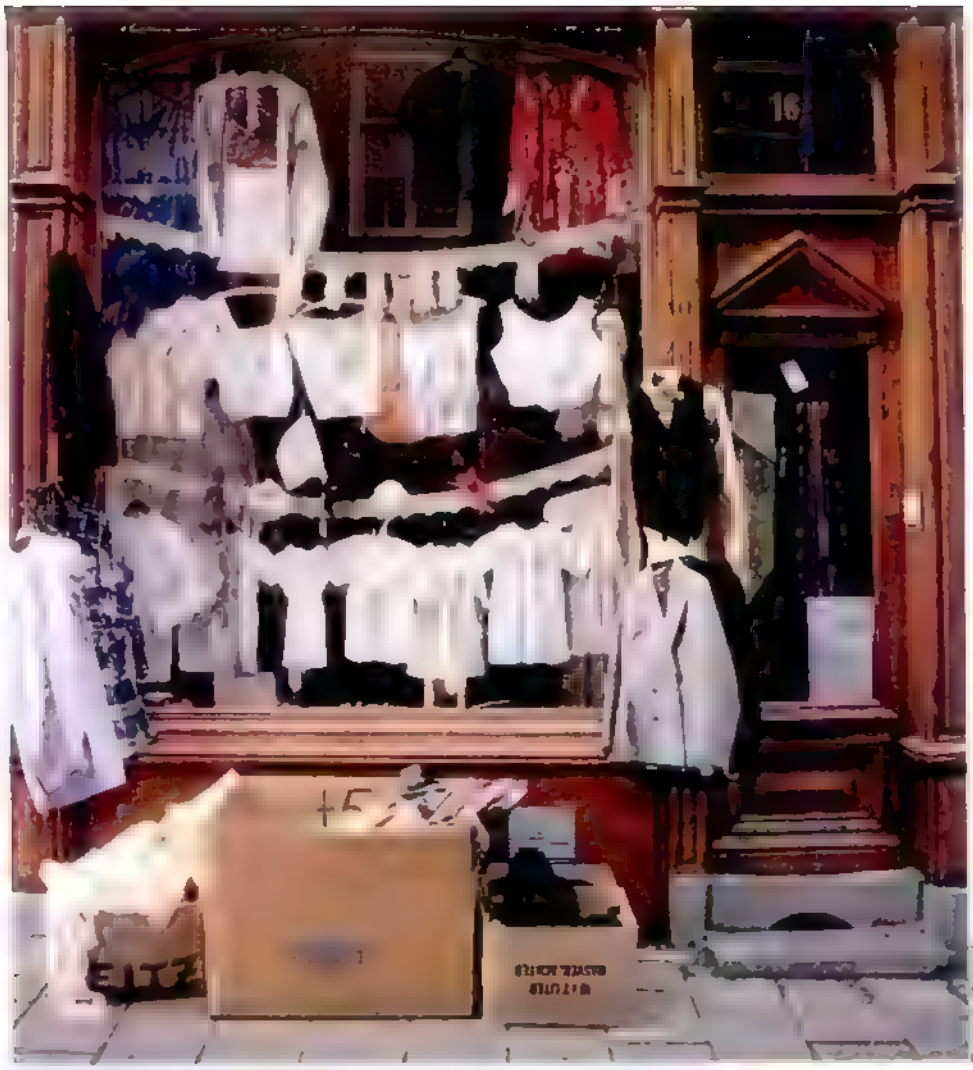
Tapdance

Old fashioned family run shops are dying out slowly, so if you know of one it may be worth a visit. One of the reasons that these shops are so interesting is that most of the family help in the running of the shop in different ways—you could try a formal family portrait with everyone gathered in front of the shop, or a series of portraits showing the members of the family at their particular tasks.

Some shops are worth photographing because they display products of skill or craft which you may not find elsewhere very easily. You may learn something as you photograph a butcher jointing meat, for instance, or a glass blower or shoemaker at work. And this knowledge can be passed on in your photographs giving them added interest.

Specialist shops such as these have a strong individual character which you can bring out in your photographs—an Italian delicatessen in which strangely shaped cooked meats are strung in thick clusters from the ceiling, for instance, or an old fashioned sweet shop in which rows of heavy glass jars contain assorted colourful confectionery, or a small pet shop in which the owner can be glimpsed among cages and tanks of chattering or babbling livestock. Specialist shop owners may, in some way, resemble their goods or trade, and with a bit of persuasion you may be able to get them to pose with their wares.

Success depends on careful composition. A rail of brightly coloured summer dresses, for instance, can look



Trevor Wood

Secondhand clothes *Look out for the colourful, if disorderly, displays of old clothes shops and junk shops*

very dull with a head-on shot. But the picture can be transformed if you take advantage of the geometrical pattern of the coat hangers and shoot close up at an angle.

Ordinary and familiar objects can be given new dimensions if they are viewed from unusual positions where they may, for instance, create abstract shapes.

Try to avoid isolating human subjects from their surroundings since their expressions, when haggling over prices or examining delightedly when they eventually discover something they like, have much more meaning if they are related to their environment. Sometimes it is only necessary to hold at bay, throwing the background out of focus or including part of a display of goods. At clothes markets you can often use the mirrors to photograph people unobtrusively.

When composing your photograph, decide what attracts you most about the subject, whether it is line, shape, colour or texture, and make this the dominant feature of your picture. For example, if the texture rather than the colour of a pile of oranges attracts your attention, position yourself so that it is strongly sidelit to emphasize the pitted skin.

When shooting indoors try to use available light if you can, as it avoids creating the disturbance which additional lighting inevitably involves. Use a fast or uprated film, and if your subjects are stationary, long exposures. Flash can be used in conjunction with natural light but you may lose some of the atmosphere which the grainy effect of fast film can give.

You can attempt to inject some originality to your photographs by seeking unusual viewpoints. Try photographing a market from a high building, for instance, so that you give an impression of activity and variety. In this way you will catch a sea of heads moving between the narrow gaps formed by the awnings. A shop interior could be photographed through the entrance which would, from this angle, act as a frame for the picture. Or you could ask for permission to position your camera inside a shop looking out through the window to catch the expressions of passers-by and window shoppers. There will be a sharp contrast between the objects inside the window and the people outside, so you will need to bracket your exposures to be certain of achieving good results.

People shopping are usually too absorbed in what they are doing to notice your camera, particularly when they are scrambling for goods at a sale. Vendors' responses will depend to a certain extent on how often they see photographers. You should always ask

Trevor Wood

Window cleaning *A reflection in the window appears to set the woman behind it on fire*

Trevor Wood

John de Visser

permission if you want to photograph the shop interior, and it will certainly be a point in your favour if you actually buy something, especially if it is the sort of shop that attracts few customers. In some countries they will be willing to pose exactly as you want them, but may expect a tip.

However, very often when photographing people it is necessary to remain unobserved. A long lens will enable you to shoot from a distance where you may not be noticed. Conversely, a wide angle lens will allow you to get very close to your subject and shoot apparently directly over the shoulder while including the person in the frame. If the area is crowded it will be easy to mingle with people and photograph unnoticed in this way. Try to make a habit of being alert and attentive whenever you are in a shopping area, and have your camera ready on an automatic setting, or at least have an average reading for the light conditions.

A quick eye and a ready sense of humour can spot some amusing juxtapositions. For example, a real cat asleep among its bright eyed clay imitations or an animated vendor selling enthusiastically to a bored looking audience. Shop window mannequins in various stages of undress are promising subjects, and people's reactions to their nudity can be very amusing.

Make use of the objects associated

Office equipment *The proud owner in front of a neat and tidy shop adds a touch of character to the shot*
Traditional markets, *such as this one in Madras, often provide interesting patterns of fruit and vegetables*

with shops and markets. Old shops often have interesting antique signs identifying them. Pale glass shop windows may reflect their surroundings, and it is possible to create surreal effects by including window displays with reflections. For example, mannequins dressed in beach wear could be contrasted and humorous way with shoppers hurrying by dressed in raincoats.

Your photography does not have to be confined to daylight hours. Winter markets often continue trading under artificial light after dark. Shop windows may be lit more evenly by artificial light than by daylight. Dusk, or early evening, is the best time to photograph as the lingering natural light will give form to backgrounds, such as buildings, roads and sky.

[illegible] can sometimes add [illegible] to your photos. Christmas [illegible] is a very popular [illegible] time to shop. [illegible] grow [illegible] Remember [illegible] at the [illegible] to other [illegible]

[illegible] yourself a lot of [illegible] and the time of day when certain pictures are best taken. Traffic and pedestrians can be [illegible] if they are unexpected. Know what you are attempting to photograph [illegible] It is not all [illegible] when the street is less busy.

John de Visser

Fresh eggs *Market life usually breeds interesting personalities which you can reveal in unusual light*
New York store *Look above street level for shots that others might miss, such as this shopfront*

Steve Herr Vision International

Darkroom timers and meters

Timers and meters are extremely useful pieces of equipment to have in the darkroom. They make precise processing and enlarging simple and in the long run can save you time and money too

[illegible] high quality darkroom work calls for a considerable degree of precision at every step. In particular, accurate exposure and the control of process times are essential and for the need of precision prints darkroom meters and timers are invaluable.

A darkroom meter is a light meter that [illegible] the exposure needed for a particular negative. Darkroom timers are [illegible] that allow you to time exposures and processes extremely accurately.

Darkroom timers

Most darkroom timers are designed specifically either for processing or enlarging exposures but there are very basic timers that can be used for both enlarging and processing. These simple timers are inexpensive and count both minutes and seconds. They may be either clockwork or electronic. The clockwork timers generally have a small clock face with a single hand and a second hand. They are switched by two buttons, one for starting and stopping the mechanism and the other for resetting the hands to zero.

Basic universal timers are usually sensitive, versatile and easy to operate but they cannot give the most precision in processing timer. It is also awkward to watch on the enlarger and the timer of the [illegible] and [illegible] are particularly pleased with the type of timer for [illegible] exposures. It is better to have a timer designed specifically for enlarging. And for the extra facilities that [illegible] the [illegible] it may well be worth paying the extra for a special processing timer.

Processing timers

Timers especially designed for processing are very [illegible] in construction, and [illegible] for timing a series of processing steps of different lengths.

The simplest timers [illegible] work in [illegible] with a rotary dial into which such [illegible] are inserted. A [illegible] step [illegible] a bell on the dial [illegible] and the [illegible] stops. On this type of timer you can see when the time is up for a processing step but you have to reset the timer for the next step. More expensive versions use electronic [illegible] to [illegible] a series of times and [illegible] very [illegible] though this facility may not be needed.

Dave King/equipment courtesy of De Vere, Ilford, Paysales & Paterson

Darkroom meters *vary in complexity between the simple spot and integrating meters and the more sophisticated combined timer-meter*

Enlarging timers

Timers designed especially for enlarging [illegible] may have the exposure [illegible] switch, the enlarger on and off [illegible] automatically. Unlike processing timers, they usually [illegible] a few minutes. A wide range is available, both clockwork and electronic, and all have [illegible] or [illegible] that [illegible] to set in the [illegible]. The seven [illegible] information is [illegible] for you [illegible] see the final setting but not so [illegible] to affect light-sensitive materials.

Although electronic timers have become increasingly popular in recent years, they do not show how much exposure time is left. With clockwork timers, however, you can see in [illegible] information at a glance and [illegible] or burning-in is much easier because you can judge exactly when to stop masking the print.

Some enlarger timers have an added feature which makes print [illegible] easier. A foot switch saves your hands free while switching the enlarger on or off. You can thus position your hands

Dave King timer courtesy of Introphoto

over the easel before you start the exposure and this makes complicated burning in or dodging much easier.

Dual purpose timers

There are some timers available that can be used both for printing and for processing. These dual purpose timers may be either electronic or electromechanical and their main distinguishing feature is a dial which counts both minutes and seconds. They also have switched outlets into which an enlarger or other device may be plugged.

Although these timers are the most versatile type available, many of the electromechanical types do not incorporate automatic repetition, this means that you must set the electronic time every time you make an exposure. This can be especially inconvenient if you are making several prints from the same negative.

Another [illegible] is that they are [illegible] expensive. A good basic purpose timer costs [illegible] and [illegible] and a programmable timer [illegible].

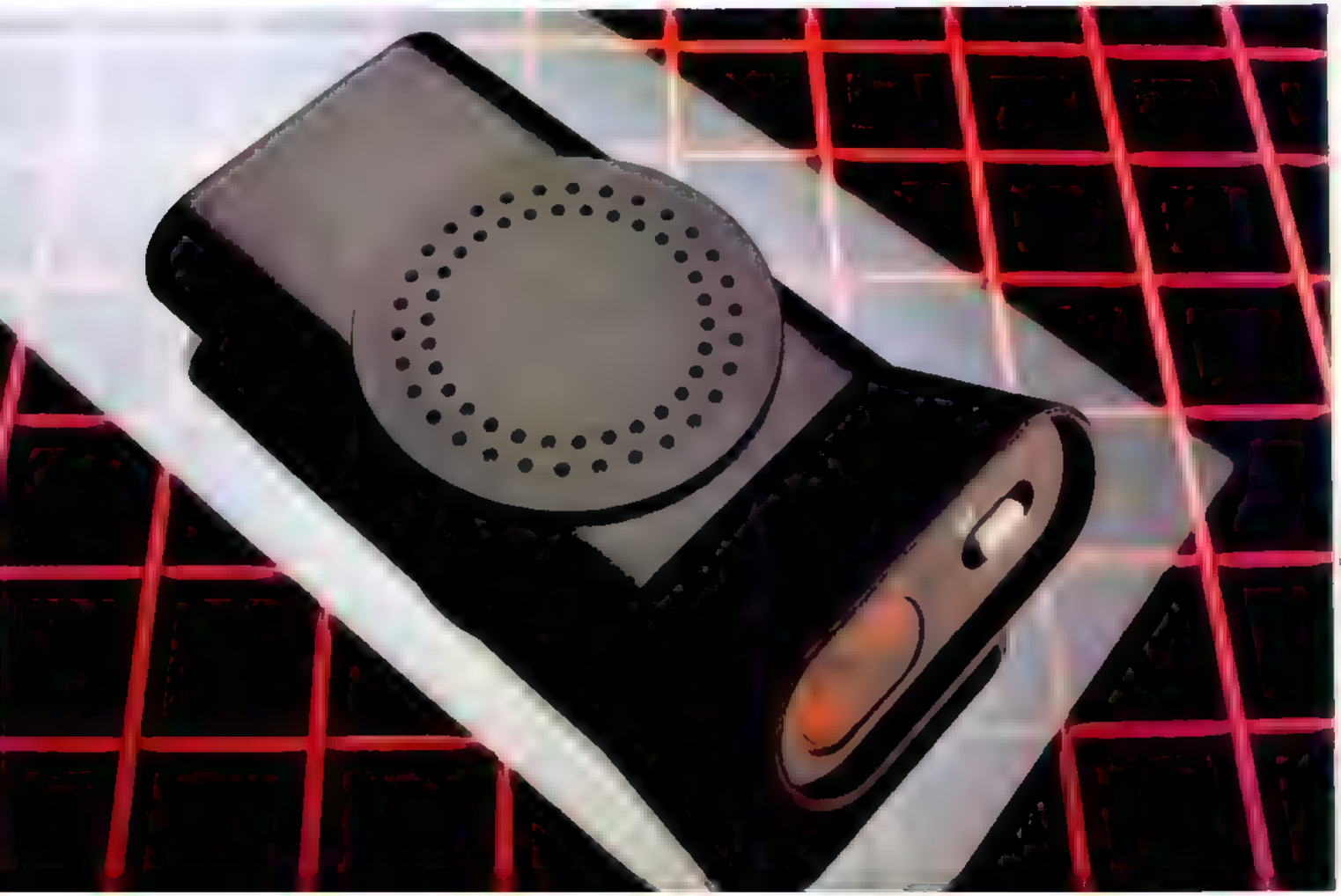
[illegible] type of timer [illegible] the multi-purpose. Before the timer [illegible] has elapsed, instead they [illegible] at regular

Dave King timer courtesy of De vere & Eumig UK Ltd

Four programs *This timer can be programmed to indicate up to four different time settings. Foot switch operation leaves your hands free*

Clockwork timers *are accurate enough for most processing and enlarging work. The Durst is useful for timing the different stages of colour processes*

Bleep timer *This battery-powered metronome timer either bleeps or emits a flash from its red light emitting diode at one second intervals*



Dave King timer courtesy of Paterson

Dave King, timer courtesy of Philips

Digital timer *The Philips PDC 112 plugs directly into the enlarger and switches it off automatically when the programmed exposure time has elapsed*

Dave King, timer courtesy of Introphoto

The Jobo B-timer *is set by the two illuminated dials on the front. It is directly connected to the enlarger and has a time range of 0.5 to 99 seconds*

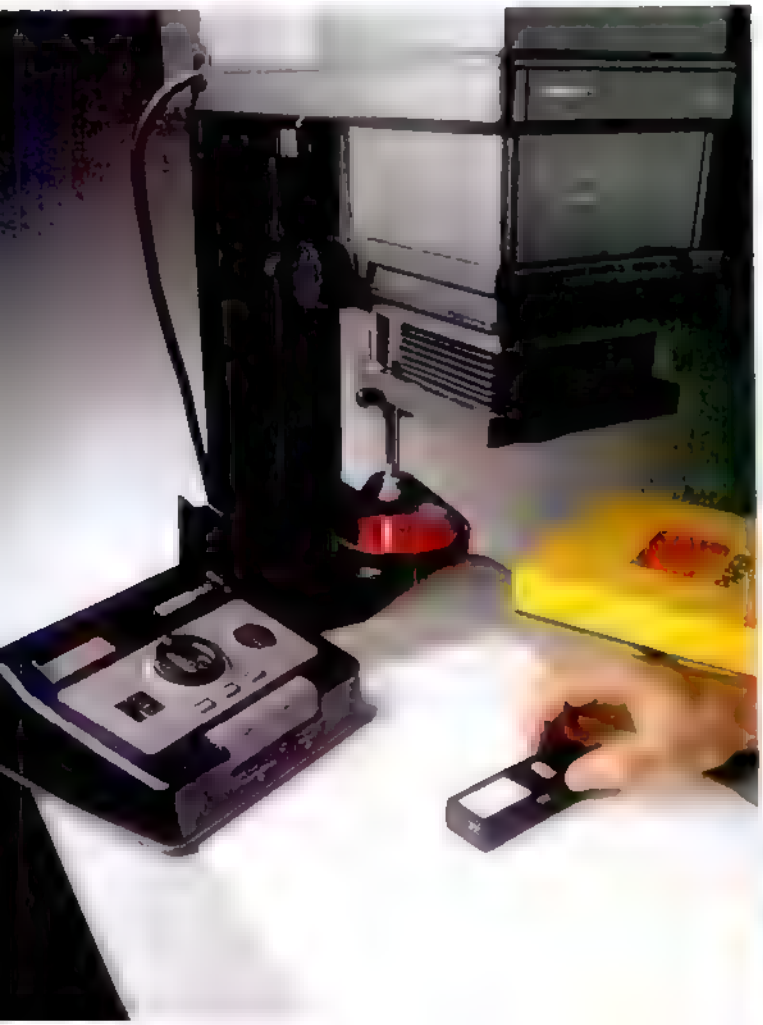
Enlarging meters

Combined timer-meters

Dave King, meters courtesy of Polyscales & Ilford

Simple enlarging meters *help you find exposure settings for prints of a given density quickly and simply. This one has LED indicators*

Integrating meters *The Paterson meter (below right) gives a spot reading, so for average exposures the diffuser must be used. The more sophisticated Hauck MSA 100 is a combined timer/meter. As a timer, it can store up to nine exposure times. As a meter, it is used to measure the density of a number of points of the image on the baseboard. Up to nine measurements can be made and the values stored. It can then compute the average figure automatically. Both the Hauck and the Paterson can also be used simply as spot meters*



Dave King, meter courtesy of Paterson

Early documentary photography

Of the many so-called social documentary photographers of the 19th century, relatively few presented an accurate record of life as it was really lived in a straightforward 'documentary' way

D O H.r National Portrait Gallery London

The pastor's visit *Hill and Adamson took this picture of the Reverend James Fairbairn visiting the fishing people of Newhaven, Scotland in about 1845*

Charles Nègre The National Gallery of Canada, Ottawa

Kitchen staff *at the Imperial Asylum, Vincennes, France. Charles Nègre's picture was part of a documentation commissioned by Napoleon III in 1859*

Merlin & Bayliss Mitchell Library, Sydney, Australian Information Service

Gold town *Part of the unique record of everyday life in the mining towns of New South Wales taken by Henry Beauloy Merlin and Charles Bayliss*

Glasgow slums, 1868 *Commissioned by the City Improvement Trust Thomas Annan documented decaying tenements just before many were demolished*

Thomas Annan Marsel Collection

[illegible] at Newhaven in Scotland [illegible] and William Bennett [illegible] the pictures [illegible] a number of [illegible]

Increasingly [illegible] to posterity for the benefit of future generations the manners and customs, the festivals and pageantry, the historic buildings and places of our time. In step in this task he founded the National Photographic Record Association in 1897. This brought together photographers from all over England and Scotland and produced over [illegible] pictures of British life and customs.

Nevertheless there were photographers prepared to show the less attractive side of society. Again, through their work, it was not necessary to reveal the unusual aspects of life to a wider public but to document those aspects.

When Dr Hugh Diamond made a series of photographs of his patients in mental asylums in the early [illegible] he attempted to use photography as a scientific tool to analyze the outer manifestations of his patients' inner conflicts.

In the 1860s in Britain the barrister Arthur J. Munby [illegible] a [illegible] of working class women and was [illegible] obsessed by them. He was particularly interested by the working conditions of the pit brow women of the Wigan mines and the photographs he commissioned, although taken in studio and [illegible] form a rare and vivid record of women in their working clothes.

The positive aspects of the movements for social reform were also recorded. In 1860 the Frenchman Charles Negre photographed the staff and inmates of the Imperial Asylum at Vincennes which had been [illegible] and [illegible] women. By using [illegible] and a tripod, Negre was able to [illegible] extremely informal images of people. This talent also produced some

The Barnardo Photo Library

Destitute child, 1882 ***Dr Barnardo was one of the first to realize the high publicity value of photographs***

[illegible] Victorian [illegible] Home and the [illegible] Barnardo herself.

[illegible] They are [illegible] of the popular [illegible] of the [illegible] to [illegible] in photography [illegible] in Europe. These pictures [illegible] photographs who wanted to [illegible] in as flattering a way as possible.

When Dr Barnardo, the founder of [illegible] wanted to [illegible] the 1870s

By permission of the Master and Fellows of Trinity College, Cambridge

he soon realized the power of photography to place the pitiful [illegible] He began to [illegible] of [illegible] and after photographs of [illegible] photogenic children.

Although printed at five [illegible] a large sum in those days, the pictures sold well. But in realizing the value of photographs Barnardo soon fell foul of the law. His [illegible] commented: 'He is not satisfied with taking them as they really are but he tests their [illegible] so as to make them appear worse than they really are. They are also taken in pairs in two positions.'

Found guilty of artistic fiction, Barnardo thereafter had to stick to the truth. That time-honoured symbol of truth and authenticity which has been used in passports and police records ever since. Ironically Barnardo's own photographs were often used by the police to identify young runaways.

The majority of European photographers still seem to have been inhibited from taking photographs that showed everyday life and the side lines where the travel photographer John Thomson produced a series of extraordinary candid photographs of the poorer classes.

The pictures were published in monthly instalments in *Street Life in London* in 1877. However the project was not a financial success and Thomson eventually decided to return to the exotic East. Thomson's pictures were unusual for the intimate way in which they portrayed people in their everyday surroundings.

While photography in Europe still suffered from sentimentality, photographers of the New World had from the earliest days of the daguerreotype, a far more direct approach.

The documentation of frontier life shown in William Notman's pictures of Canadian lumberjacks, Alfred Burton's New Zealand photographs and the pictures of early Australian goldmining towns taken by Henry Beaufoy Merlin, is refreshingly free of all traces of artifice.

More direct photographs of everyday life were produced in Europe from the 1880s. Freed of some of the technical restrictions of their craft by the introduction of smaller cameras and faster film photographers felt able to go out on to the streets in search of subjects.

Both Frank Meadow Sutcliffe and Paul Martin experimented with the new technique in England. Sutcliffe, a Yorkshire photographer who took many pictures of traditional life on the coast, produced some of the earliest photo-sequences. He was also able to achieve a natural, unposed look in his photographs by carefully observing his subjects and then asking them to assume poses that would feel comfortable during long exposures of up to 15 seconds.

Paul Martin was probably the world's first truly candid photographer in the [illegible] and [illegible] he took to the streets with his camera concealed in brown paper or in his trousers. The images produced were highly original and showed the street life of Britain in a way that had not been possible before.

A [illegible] were used by the photographers of the short-lived French magazine *Jours Modernes* founded in [illegible] which pioneered the use of candid photography in the press.

Towards the turn of the century the press also began to take an interest in social documentary photographs showing some of the blights on society in order to speed up reform.

The most [illegible] of this type of photography were Jacob Riis and Lewis Hine. Riis was a Dane who emigrated to the United States in [illegible] Employed as a reporter he started using a detective camera and flash [illegible] to expose the appalling living conditions of many of the New York [illegible] in New York, and his book, especially *How the Other Half Lives*, published in 1890, [illegible] reformers.

[illegible] the [illegible] after the introduction of smaller, light cameras, the upper class became [illegible] for the candid photograph.

Frances Benjamin Johnston Library of Congress

Wigan pit girl, 1869 ***One of a series of portraits taken for Arthur Munby by a studio photographer, Louisa Millard***

Paul Martin Victoria & Albert Museum

Blind beggar *Using a camera concealed in brown paper or a briefcase, Paul Martin took some of the first truly 'candid' pictures of everyday life*

Sailors off-duty *Frances Benjamin Johnston was commissioned to shoot Admiral Dewey's fleet while it was touring the Mediterranean in 1899*

Italian immigrants, 1905 *Lewis Hine documented the horrors of arriving at America's immigration centre at Ellis Island to try and improve conditions*

Lewis Hine George Eastman House

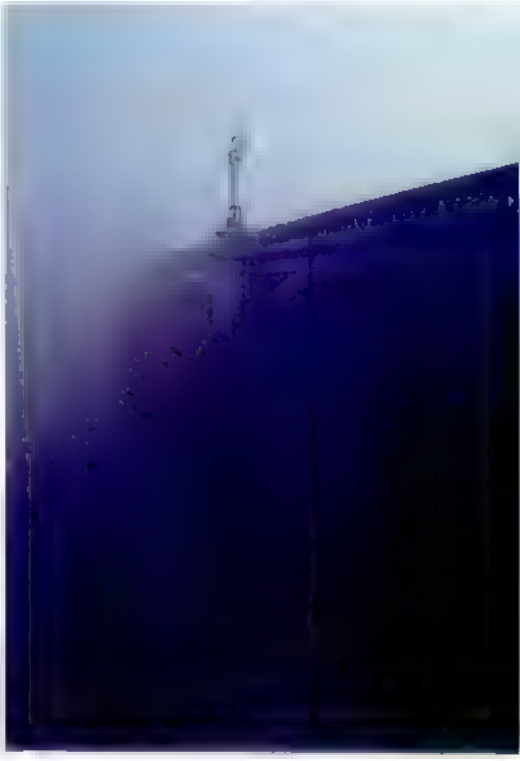
Fog, mist and haze

There is no way of making a murky day look clear and sunny, but there are a number of techniques you can use to reduce the effects of fog, mist and haze to a minimum, or even turn them to your advantage

John de Visser

Early morning *By exposing for the bright sky, the photographer has used the mist to hide unwanted detail, and made an abstract pattern from the trees*

Blue bridge *In thick fog, your subject may be invisible until it is almost on top of you. The answer is to move in close and use a wide angle lens*



John Syms

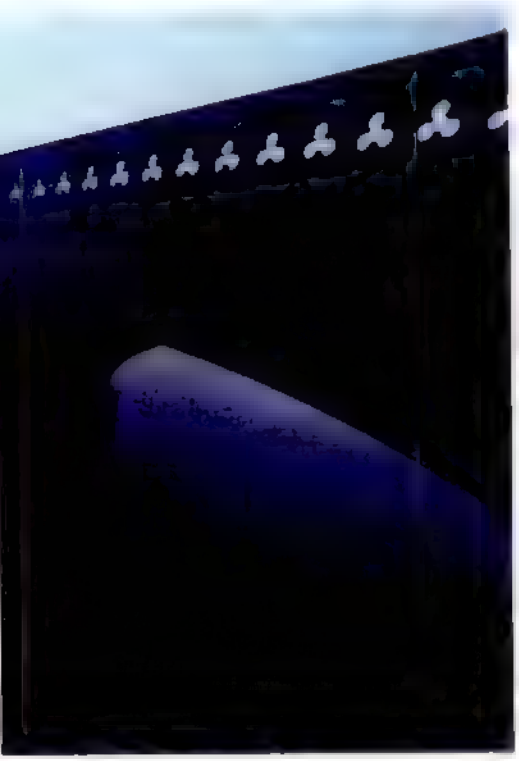
becomes so pronounced that the landscape can appear to be made up of several distinct planes stacked in front of each other. Apart from the graphic possibilities that this offers, it has two very practical uses in photography: it helps you to convey by separating objects visually from their surroundings, for instance, and it can prevent distant, uninteresting elements, for example, trees, from being isolated within a scene to provide a busy, simple image.

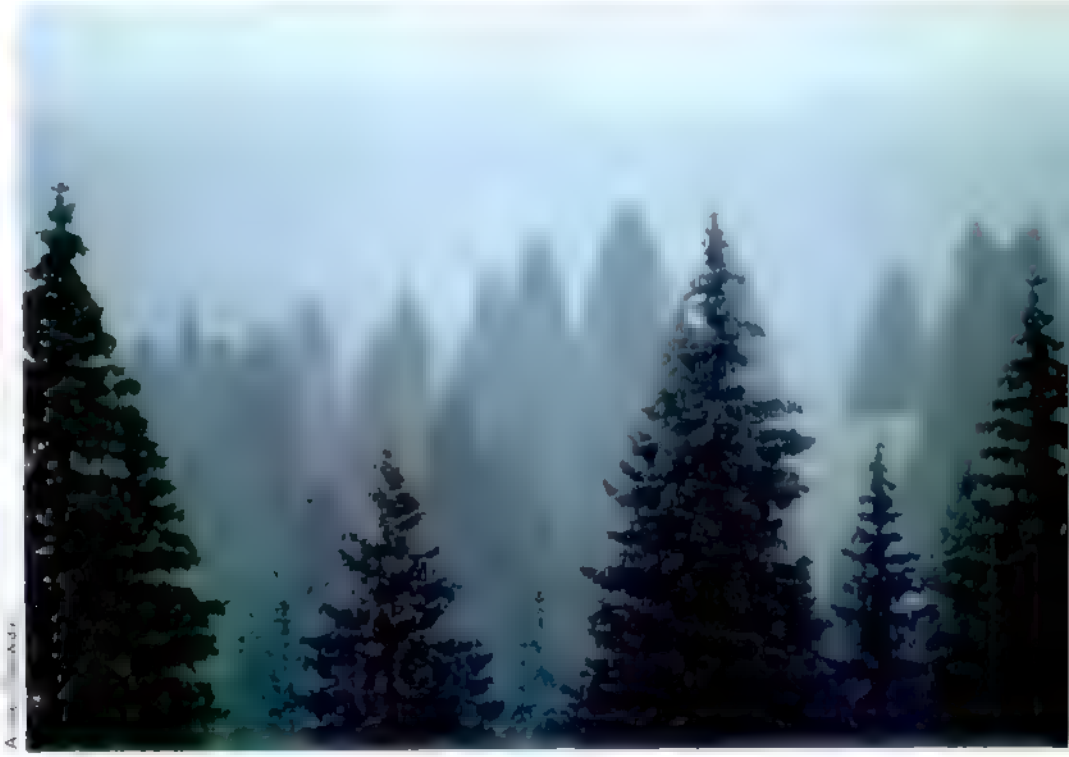
There is a positive use of fog—focusing attention on the subject—but it is also potentially useful to be able to remove areas and settings that are either ugly or inappropriate. A line of pylons running across the sky in the distance, or the smoke stacks of a factory, may be an unfortunate part of the picture, particularly if you have only a limited choice of viewpoint. Here, a light mist will conveniently remove the intrusions from the image. In these ways, mist and fog can be thought of as very selective lighting conditions, so that if you are able to choose the time and day for a photograph, they actually give you some increased control over your subject.

One of the most attractive features of fog and a light mist, from a visual standpoint, is that they sometimes appear as just a thin covering over the land, so that the objects such as trees and houses appear to rise out of it as islands. Such a high viewpoint can be very rewarding, particularly when the fog is moving and wisps drift across the landscape. Such fine gradations are possible only under these conditions, when the thickness of the layer must changes across the scene.

Telephoto haze *By using a telephoto lens lens, you can exaggerate the effects of mist and use it to give a strong sense of depth to a picture*

Charles Lenars, Atlas Photo





Rocking chairs *Dense fog conceals ugly background detail, and you can use it to draw attention to the interesting shapes of objects close to the camera*

Mist on the water *Low lying mist soon disperses, so rise early. Choose a camera angle where the mist is lit from the side by the first rays of sun*

Cutting through the mist

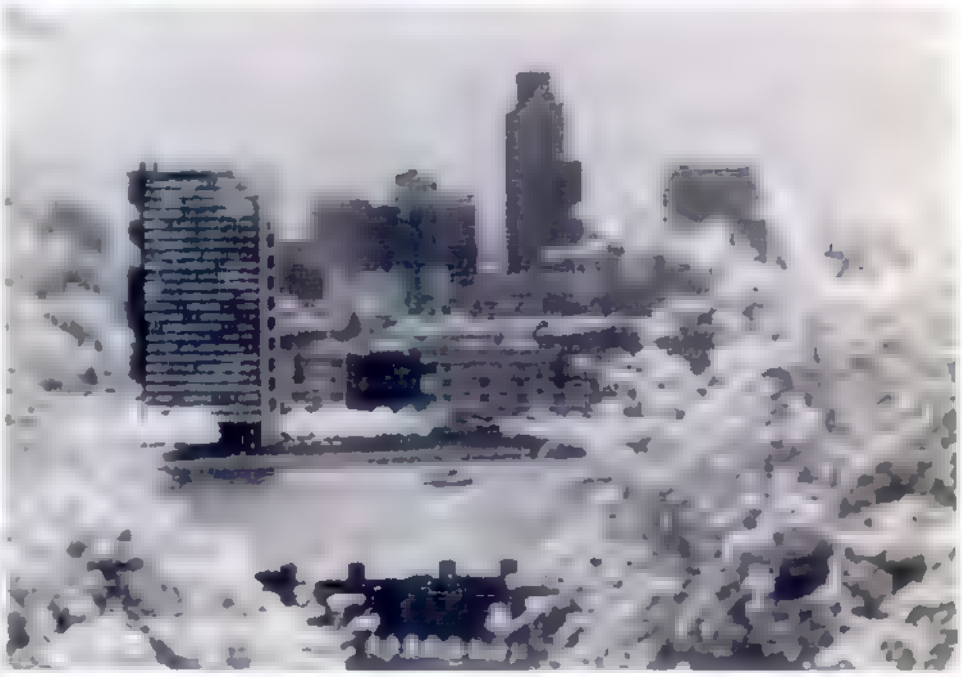
Cutting haze with infrared

One dramatically successful way of eliminating haze in a distant view is to use infrared film (see page 794). This film is manufactured with an extra sensitivity to the invisible wavelengths beyond red—those that are least affected by scattering in the atmosphere. Infrared film is, however, also sensitive to other wavelengths, so that to get the best from it, you must use an appropriate filter. Black and white infrared film is sensitive to violet, blue and red, as well as to infrared, while colour Ektachrome infrared is sensitive to green, red and infrared—rather than blue, red and green, as in a normal colour film. Since it is the ultraviolet and blue end of the spectrum that contributes most to the effects of haze, a yellow or orange filter, at the very least, is essential.

Colour infrared film has, in addition to its haze-clearing properties, the more startling effect of false colour, particularly with living vegetation, which it records as red or magenta instead of green. Black and white infrared film, on the other hand, can be used as a more normal substitute for regular film: with a red filter such as a Wratten 25 or 29, some of the visible spectrum contributes to the picture, but with an 87 filter, which is visually opaque, the haze penetration and the contrast are intense. In both cases, vegetation appears very bright, because the green chlorophyll in plants reflects infrared light very strongly. For exposure, follow the instructions packed in the film, bearing in mind that your exposure meter is not sensitive to infrared. An example of haze penetration with IR film is shown on page 1148.

Most lenses are designed to focus only visible light, and with infrared film you must focus a little nearer than you would normally. Most lens mounts are marked with a red dot next to the focusing index—use this as your new focusing mark.

While infrared film is ideal for eliminating haze, it actually gives worse results than normal film in fog; the water droplets are so large that they reflect all wavelengths, especially infrared.



Infrared cityscape *Dust particles which scatter light and cause haze have no effect on infrared. But by using a special film and a filter which blocks all wavelengths except IR, haze can be virtually eliminated. The lower picture was taken on conventional film*

John Heseltine

[illegible] is given by a Wratten 25 deep red filter. Unfortunately, with such a deeply coloured filter in place exposure must be increased by four stops.

With colour film, really effective haze penetration is not possible, because strong coloured filters cannot be used. An ultraviolet filter helps a little, but its effect is only really obvious at high altitudes, where ultraviolet scattering is strongest. Some ultraviolet filters have a pale yellow tinge to counter the blue scattering visible when a telephoto lens is used for a distant view. However, when using a telephoto the simplest way to control haze is to carefully choose the time of day and the viewpoint. Generally, haze is weakest early in the morning and strongest in the early afternoon. It is also most obvious with backlighting. If you have the choice, select a camera position where the sun is behind or to one side of you.

Depending on the camera position, you may find that the most effective filter is a polarizer. Although better known for its more obvious properties of darkening blue skies and cutting reflections from non-metallic surfaces, one of the most useful functions of polarizing filters is to eliminate reflections from haze particles—at least those at right angles to the direction of the sun—and to improve contrast and colour saturation. Contrast can also be improved by using an effective lens hood.

With both black and white and colour film, you can heighten contrast further by increasing the development as described on page 1058. If you are prepared to accept the extra graininess, the slight increase in contrast may be valuable.

Nevertheless, the most certain way of avoiding the effects of haze is to move closer to your subject. The nearer you are, the less atmosphere and so the fewer particles there are in front of the camera. This means, where possible, using a wide angle lens. Also, because subtle and neutral hues make it easy for the eye to distinguish the bluish cast that is characteristic of haze, a brightly coloured subject is better.

Exposure control

Because of the light scattering effect, fog and mist can often present problems with exposure. Fog and mist generally bring an overall bright tone to a scene so that if you follow your meter's reading unswervingly, you run the risk of an underexposed photograph. Exposure meters average the light that falls on their cells from different parts of the subject, and deliver a setting that produces a mid-toned result. If most of the picture area is taken up with white mist, the exposure that your meter recommends results in an image that is grey rather than white. [illegible] warm up [illegible]

[illegible] actually taking a shot.

Learning to exercise some photographic control over weather conditions such as these, either by accentuating their most useful characteristics or suppressing those that you do not want, extends the range of conditions under which you can successfully take good photographs. This in turn gives you the opportunity to explore landscapes and other outdoor subjects in a variety of ways, rather than just in stereotyped good weather.

Making paper negatives

Printing from paper negatives is more than just a quick and easy way of making black and white prints from colour slides. The technique allows you to produce some unique effects

The original negative-positive photographic process was invented in 1839 by William Henry Fox Talbot. This consisted of exposing light-sensitive paper in a camera and contact printing the result to make a positive print. But with a little variation, the basic process offers much more scope than this. With what is known as the *paper negative* process, you can make b/w prints from colour slides, give prints a unique textured appearance or produce a variety of interesting effects.

Paper negatives are easy to make and to print, and the final result can be toned or otherwise worked on to heighten the impressionistic effect of positives made in this way.

Apart from its pictorial uses, the paper negative process is potentially valuable as a means of retouching unwanted detail from a photograph. It can also be used to salvage very thin and flat negatives where some part of a picture is required which would be difficult to obtain by conventional printing.

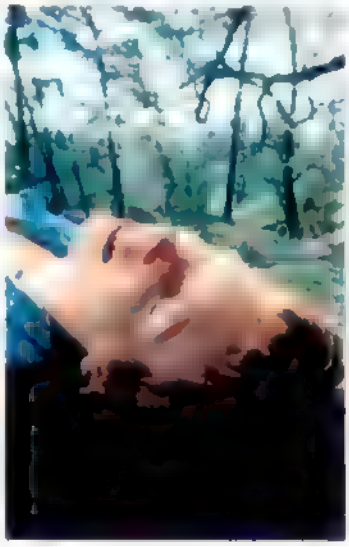
Although you can expose the paper negative directly in the camera, as Fox Talbot did, the modern technique is to prepare the paper negative in the controlled conditions of a darkroom. This paper negative is produced in a similar way to an ordinary print from a negative, and then contact printed – emulsion to emulsion – on normal or special printing materials to make the final print.

You can use resin coated paper, plastic based materials (such as Opaline), or conventional fibre-based bromide paper for the paper negative itself. If you are using fibre-based paper instead of the new much more widely available RC materials, use single-weight paper as this transmits more light than double weight. Always use material with a glossy surface as this permits better contact between two emulsions when contact printing.

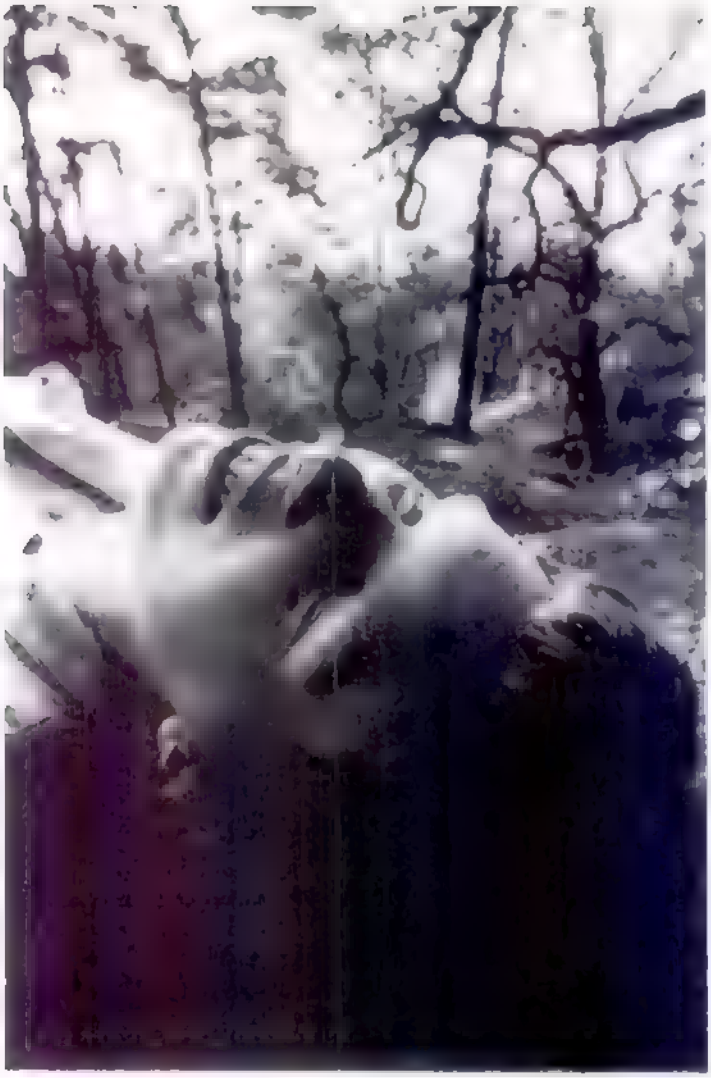
Although you can make paper negative prints of any size, larger ones are preferable if you want to preserve fine detail. An exhibition size 40 × 50 cm print is not too difficult to handle and has the added advantage that special retouching techniques (see over) can be carried out more precisely.

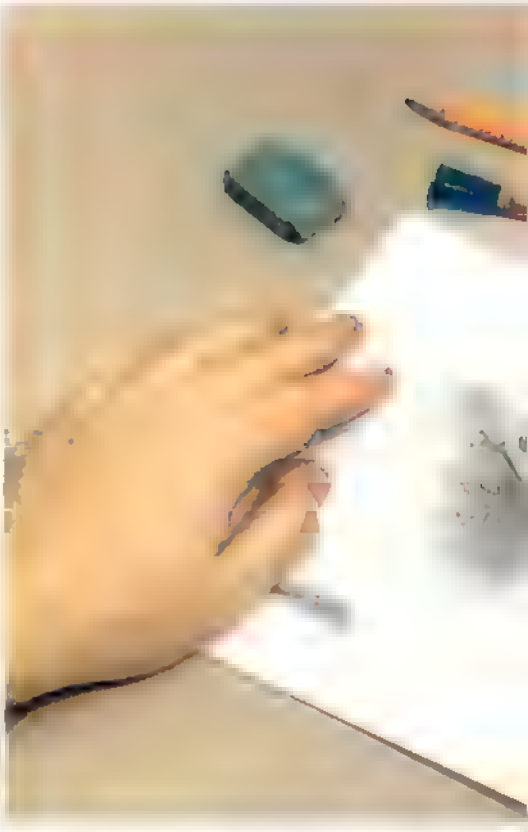
In addition to normal paper and chemical requirements, you will need a contact printer or, at its simplest level, a

Negatives from slides *For a guide to the quality of the negatives you can make from your slides, try making a contact sheet (above). From this you can judge which slides have the best contrast and density for printing. Once you have selected a suitable slide (below), it is easy to make an enlarged negative on resin coated black and white paper (right). You can burn-in or shade detail in the tonal range of the neg*



David Hoffman





Jon Bowcher

Retouching *The first test print (left) is sharp and well exposed overall, but does not show enough detail in the subject's hair. To remedy this, the paper negative can be pencil-retouched on the back. If you work on an ordinary desk, right, hold the negative up to the light from time to time to check that you are working on the right areas of the image. A light box is a useful but expensive aid to this kind of work. Use soft grade pencils, an eraser and other drawing tools to achieve the effects you want. Areas that you darken on the back of the negative become lighter on the final print (lower right)*

sheet of glass and a sponge mat to keep the paper negative flat during printing (see pages 25[illegible] to 253).

Working from transparencies

The easiest method of making and printing a paper negative is to work from a colour transparency because there is no need for an intermediate positive. The transparency is printed directly on ordinary print material to produce the negative.

You must bear in mind that most black and white papers are sensitive only to blue light, if they are orthochromatic, to blue and green. A print of a scene containing for instance blue sky and red flowers will have incorrect tone values when printed. The sky will appear on the negative much darker than it should and will print very light in the final positive. Reds, on the other hand, will come out very light on the negative and so these will print very dark. Other colours will be rather distorted tonally. While this can give attractive if unreal results—pictures have an old photograph look about them—you cannot expect faithful reproduction. This is the major limitation of the process, unless you use panchromatic paper (see page [illegible]).

When handling the paper negative place the original side (emulsion side) up in the enlarger, otherwise your final print will be inverted, like a mirror image, when contact printing takes place.

Set up the enlarger in the usual way and expose a test strip to determine the correct exposure for the paper negative. If you are trying the technique for the first time, aim for a stronger, lower contrast image than perhaps you are normally used to in conventional printing. This helps maintain a good range of tones.

Examine your test print by transmitted light, preferably by placing it on a light box. This helps you judge the density of the tones once you gain experience of the way the negative prints. But initially it is best to try out various negative densities by actually printing your test prints.

You may find that you have to hold back some areas, such as sky, which tend to become too dark on the negative print. All normal shading and masking techniques can of course be used. It is best to perform these when making the negative, as you cannot see the image when contact printing.

Working from negatives

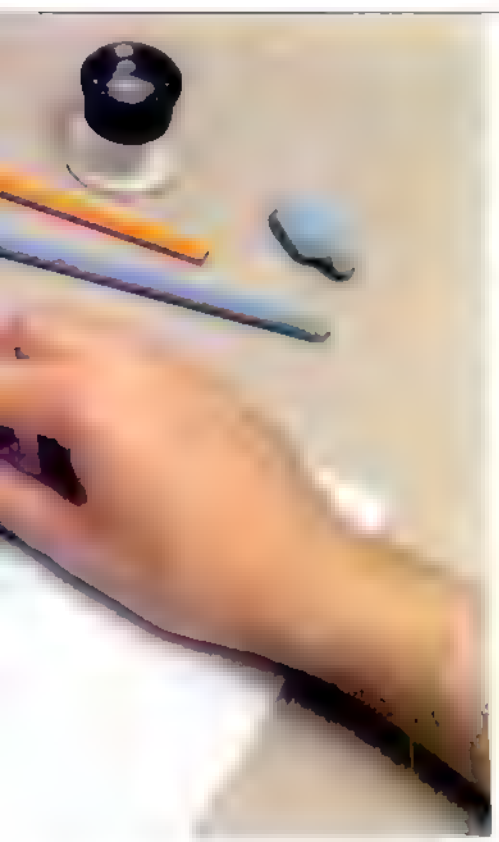
The procedure is a little more involved if you decide to work from a negative. First you make a print in the normal way but of much lower contrast than normal. This print is contact printed on to another sheet of paper to produce the negative, which is used to obtain the final positive. This roundabout way of producing a final positive has its drawbacks. Each time an image is made contrast increases and to counteract this special steps must be taken to obtain the lowest contrast possible—unless, of course, you are after a particularly strong graphic effect.

Image quality breaks down on successive prints and there is nothing you can do to prevent this except to reduce the number of stages where a paper intermediate is used. So unless you are using the paper negative expressly for its peculiar characteristics—or for retouching purposes—you may prefer to make an intermediate positive on film rather than paper to preserve as much as possible of the original image quality until the paper negative stage is reached.

This positive image can be on lith, panchromatic or ortho materials according to your needs. The copy can be made by contact or by enlargement (see pages 1[illegible]21 to 1[illegible]). If you are working from a colour negative panchromatic material should be used. Kodak Kodalux could be used for the same reason if you decide to make the intermediate positive on printing paper but you may find the maker's name printed on the back will show through in highlight areas—though this can be retouched out.

Retouching

One of the great advantages of paper negatives is that they can be retouched very easily. To do this, place the print on a lightbox. Retouching, which is to show up sharply, can be done on the emulsion side but usually it is better to work on the back of the print. This poses no difficulty where film based print materials is concerned but RC paper may need priming with special clear lac-



touching lacquer spray if really elaborate work is attempted. Soft leaded pencil can however be used for many small retouching jobs on the back of RC prints. But take special care not to smudge or remove your retouching.

Red and black spirit pens, crayons, chalks, dyes and inks can all be used with varying degrees of success and they are essential when retouching a resin coated negative. Any retouching on the back of the print is diffused by the base material of the paper but harsh edges should be avoided. You can do this by feathering or uniformly smudging detail using your fingers or a stump of paper.

Detail which you wish to darken in the final print must be lightened in the original. Knifework see page 768 shows up noticeably and it therefore better to use bleach to remove or lighten detail in the negative. Lightening detail in the final print, however, is much easier—you simply increase the density of the negative image by burning-in during the exposure.

Printing the negatives

It was once common practice to make a paper negative more translucent by rubbing oil into the paper fibres through the back. This enabled really subtle tones to be reproduced. But the process is messy and not without its problems and is now rarely used. More significant is the now almost universal use of RC material which is impervious to oil. This, as well as conventional fibre-based material, can be contact printed when dry or even when touch-dry without all the intervening fuss and bother associated with oiling.

Set the enlarger so that the light beam fully covers the area of the contact printing set-up you are using. Sandwich your wet paper negative, emulsion side down, between the glass and a sheet of printing paper. Then make a test print at full aperture covering a broad range of times, exactly as you would in normal printing. Carefully remove the paper and process this as usual.

You will find that for a particular enlarger height and aperture setting print exposure times will be fairly constant for most of your paper negative printing. So carefully note the settings for future use, making minor adjustments to these where experience tells you to.

When you have had a little experience of the rather drawn out procedure of producing at least one dried print on the way to printing the final image, you could experiment with short cuts. Instead of waiting for the negative print to dry, blot or squeegee this so that it is touch-dry only. Lower the damp negative print centre first on to the printing material you are using for the final image, then sandwich it on the glass to maintain good contact.

For quick proofing work—and some very strange effects—the short cut could start even earlier. At the end of development briefly rinse the negative print in cool water and blot or squeegee it touch-dry. Continue working under safelight conditions and take the developed but unfixed print and lay it on a sheet of printing paper, centre first, this helps prevent the formation of air bubbles. Expose the negative as usual but avoid long exposures as the print will begin to solarize by the end. This phenomenon can be used to create some interesting one-off images, either on the first or on a subsequent print, depending how quickly image breakdown and fogging occurs.

David Hoffman

Assignment

Country church

Trevor Wood shows how a simple country church can provide as many varied pictures as a cathedral, given the right approach

Trevor Wood

Trevor Wood is well known for his landscapes and views of British rural life. In this line of work he is always on the lookout for possible locations like the attractive Norman church featured in this assignment.

Before he even started taking photographs Trevor walked around to find the best aspects of the church and the best angles from which to approach them. In the opening shot on the left it can be seen that Trevor wandered quite far away from the church itself to take one of his shots. It shows that to photograph something like this you do not necessarily need to get very close.

This first photograph features the church as part of the landscape. A low viewpoint has been adopted so that the reeds in the foreground fill half of the composition. It avoids the effect often created by taking relatively wide angle landscapes—that of a lack of immediacy and of the view being pushed away from the camera, with plain expanses of sky. Since there is plenty of detail in the foreground area—the reeds and the river—Trevor composed the shot so that the horizon was well toward the top of the frame. The careful use of viewing angle also makes the river reeds lead more directly to the main area of interest—the church itself.

Having set the scene Trevor was then able to move in closer, photographing both the church as a whole and details of the interior.

Thanksgiving arrangement *For shots like this, plenty of depth of field is needed to ensure that everything in the frame is sharp and that the contrast in textures would be appreciated in the final image. To do this, Trevor gave a five second exposure so that he could stop his 50 mm lens down to f 16. He included some stonework in the foreground so the display was still related to the ecclesiastical setting*

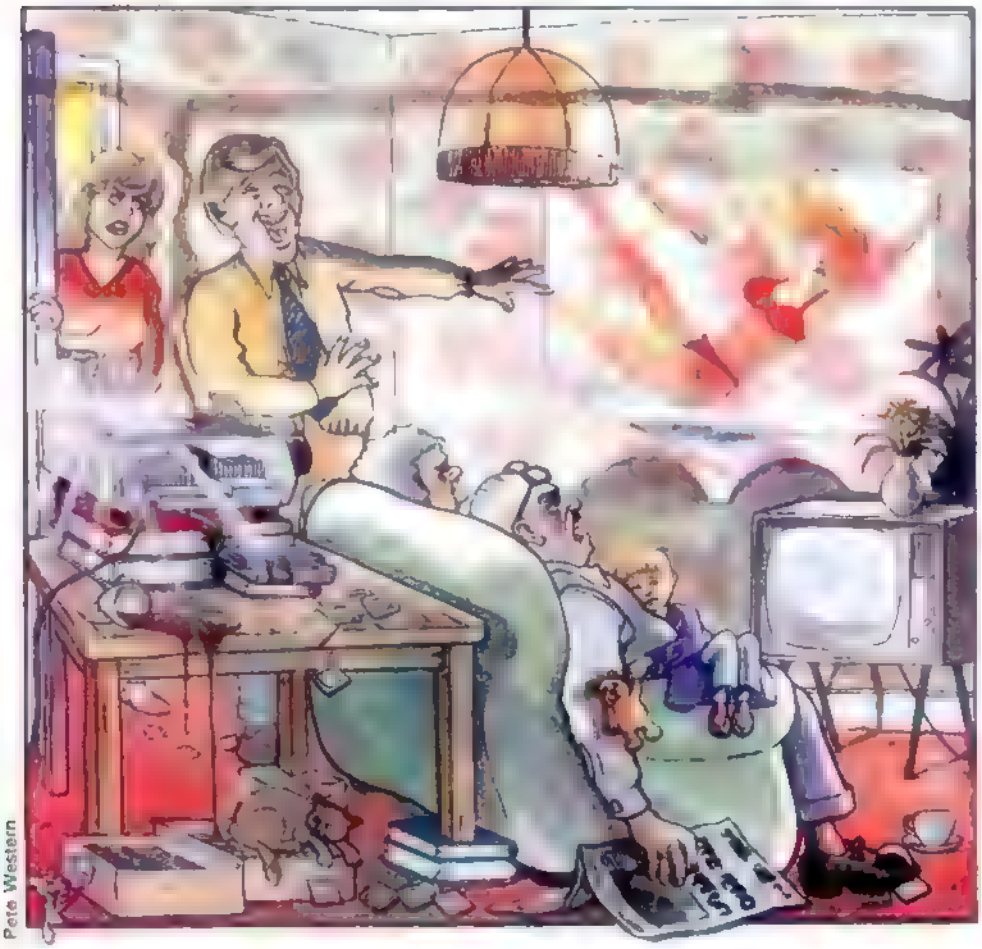
Reed gatherers *In the opening shot of the church at a distance you can just make out the reed gatherers in the background. However, in this closer shot (left) the workers are strongly featured. Apart from creating foreground interest, it also has the effect of combining the traditional annual activity of gathering reeds with the traditional communal symbol of the church.* **Interior** *Trevor took one photograph of the arches and the windows and another one of the rich colour and texture of the floor. He also shot both features together. For this it was necessary to think carefully about what to focus upon—even though this was taken with a 24 mm lens which has a wide depth of field. Trevor knew that if he focused on the background, the stones of the floor would appear disturbingly out of focus*

Evening light *For a more atmospheric study of the exterior of the church, Trevor waited until early evening so that he could make use of the warm light from the sinking sun. It reflected off the masonry and cast long, dark shadows investing the photograph with an eerie presence. The combination of weak evening light and slow transparency film—Ektachrome 64—meant that a tripod was needed for many of these photographs to avoid camera shake which is inevitable at the slow shutter speeds*

Improve your technique

Better projection

The way you project your slides can be more important than you think—bad presentation can ruin a slide show, however good the pictures may be



Pete Western

While colour prints are ideal for passing around among friends, slides are sharper and brighter and give more natural colour. All too often, however, the superior quality of slides goes unnoticed: viewed against a bluish window or an orange table lamp. For your slides to be seen to best effect, they must be projected on a screen in a darkened room and made into a properly prepared and presented slide show.

The first priority is to ensure that the room for the show can be properly blacked out. Although stray light has little effect on the bright highlights of a projected image, it makes the shadow areas seem washed out and pale, and generally reduces the contrast of the picture. This can ruin slides where shadow detail is important, and even contrasty slides with a good range of tones look much more pleasing if the room is totally dark and does not have light leaking in everywhere.

For this reason, most slide shows are held at night, usually with any curtains drawn to keep out light from streetlamps. If you intend to show slides during the day, you must take special measures to black out the room in which you normally show your slides. Shutters, blinds and thick curtains all help to black out windows.

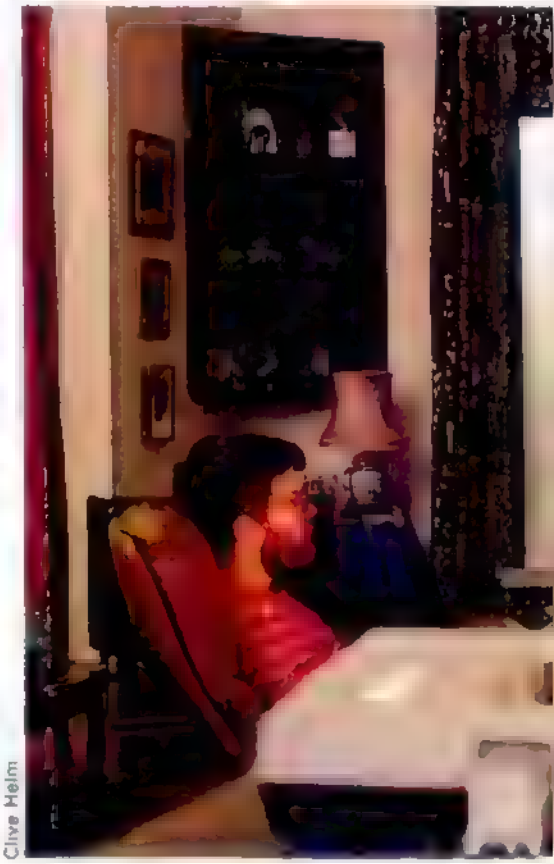
When you are blacking out a room, do not neglect the projector itself. Every projector has grids or slats in the casing through which warm air from the bulb can escape, and in most modern projectors these grids are either carefully baffled or a long way from the lamp. Older projectors, or those cooled by convection currents, may not be so well sealed against light leaks. Ventilation holes must not be blocked or the projector will overheat, but there are other ways around the problem.

If light leaks from the top of the projector, a sheet of black velvet or card pinned to the ceiling may cut down on the light reflected on to the screen, but if the light leaks are severe, more radical measures may be necessary. Putting the projector in a cardboard box with holes cut for the lens and controls will certainly eliminate stray light, but you must make sure that enough air reaches the projector to prevent overheating.

If you cannot black out your screen room successfully, you may be able to partially compensate by increasing the brightness of the image on the screen, giving greater contrast between washed out shadows and highlights. The simplest way to increase brightness is to move your projector closer to the screen, concentrating the light, but if you are showing your slides to more than a couple of friends, this solution is not the best as it produces a small picture.

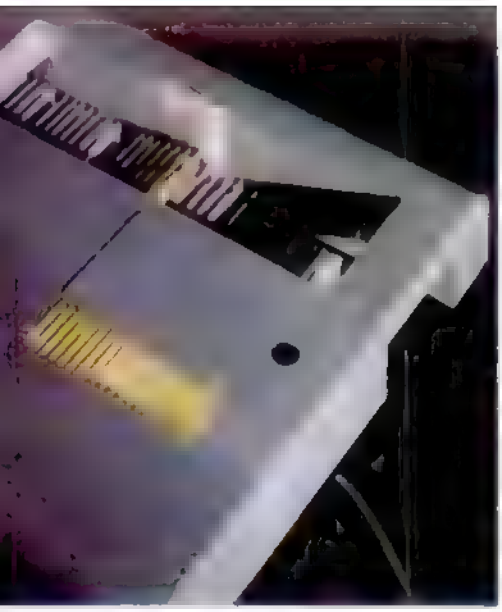
If your projector has a power control which allows you to set either half or full power, make sure that it is set to full power—this helps to increase contrast in a badly blacked out room. Do not be tempted to leave it set on full power all the time, though, as this reduces lamp life considerably.

If your projector is fitted with a low wattage bulb, you may be tempted to fit a more powerful lamp. This is not



Clive Helm

Clearer colours *A poorly blacked out room can drain all the brilliance from your slides. Try and eliminate as many light leaks as you possibly can*



Light spill *A badly baffled projector can add significantly to the level of ambient light in a projection room*

advisable, however, because a more powerful lamp automatically produces more heat as well as more light, and the extra heat may be sufficient to damage your slides and the optical system of your projector. There is also a risk of overloading the projector's electrical circuitry. Check the projector instruction manual very carefully before attempting to use any lamp other than the one supplied with the machine.

The best screen

The right screen is as important as a properly darkened room and powerful projector. The nature of the screen determines the sharpness of the image, its brightness, and even the angle at which the image can be seen.

Often the simplest screen is the best. A plain matt white wall or a large sheet of uncrumpled stiff white paper gives the sharpest possible image, and the image can be seen by viewers sitting at a wide angle from the projector-to-screen axis, although at wide angles to the screen the image looks increasingly distorted. Often, though, a suitable expanse of wall is not available, or it may be difficult to store a large piece of uncrumpled white paper.

Positioning projector and screen

When you are setting up a slide show, choose a room that allows plenty of space to move around. Position the screen so that it faces away from any source of light, ears—this usually means placing it against a wall.

If you are using a screen which reflects light in a narrow cone, such as lenticular and beaded screens, make sure that everyone in the audience sits in a position where the projected picture is clearly visible. This usually means putting seats in the centre of the room, close to the axis of the projector lens.

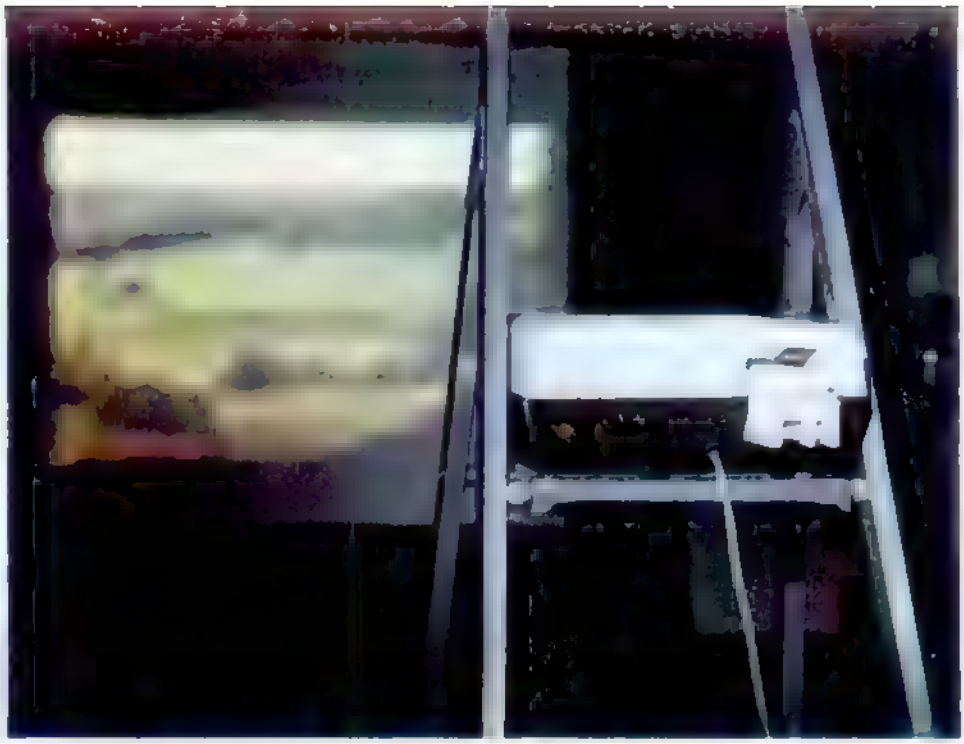
The projector should be placed on a firm base at the same height as the middle of the screen. Household tables are rarely high enough to put the projector far enough off the ground, and maintaining the extra height is sometimes a problem. A stack of telephone directories or a chair placed on a table are not really stable enough. If you have a step ladder of the right height, you may find that this makes an excellent make-shift stand, provided the platform is big enough. If you frequently present slides, a purpose-built projection stand may be a worthwhile investment.

Every projector has an adjustable foot, and some have two. These are for ensuring that the projector is level, not for raising the front of the projector if it is too low. Tilting the projector upwards excessively distorts the shape of the image on the screen so it is wider at the top than at the bottom, and makes it impossible to focus either the top or the bottom as sharply as the centre. Ideally, the projector should be mounted at screen level and aimed exactly square to the screen.

The distance between the projector and a screen depends on how large you want the image, and on the focal length of the projector lens. Long focal lenses form smaller images and are suitable for large rooms. The chart on page 39 shows how far a projector must be placed from a 1.5 m wide screen, if the projected image is to fill the screen. For a larger screen the projector must be proportionately further away. For example, to form a picture double the size—three metres wide—the projector must be twice as far from the screen as the chart shows.

Avoiding distractions

Before you show your slides, you should make sure that as many distractions as possible have been eliminated so that your audience can give their undivided attention to your pictures. It is a good idea to prepare everything well in advance and have a rehearsal before your audience arrives. If your slides have cardboard mounts, check that none of them are damaged or have loose corners that are liable to jam in the projector. The best slide mounts for projection are



Guy Helm

Stepladder stand *Piles of books make an unsteady support for a projector. A better solution is to use a stepladder*

the [illegible] and [illegible]. These were [illegible] with [illegible] and [illegible] the [illegible] from dirt and fingerprints. In addition, they stop [illegible] from popping out of focus if they warm up and expand in the projector gate. Slide popping can be [illegible] even though [illegible] focusing devices in many projectors quickly restore correct focus.

If your projector has a manual slide changing mechanism, in which [illegible] feed through the projector gate one at a time, holding each slide briefly in the correct start to without the ventilation slots before you feed it into the gate, you reduce the tendency to pop. Some sophisticated magazine holding projectors include mechanisms that preheat slides by similar means.

Make sure that all the slides you are intending to show are correctly oriented so that you do not need to check the orientation every time you feed in a slide. The best way of doing this is to put a small spot in the bottom left-hand corner of the slide mount with the slide held so that the emulsion side is facing away from you. Slides should then be fed into the projector so that the spot is in the top right corner that is upside down with the emulsion side facing towards the screen. You can make spots on slide mounts with a marker pen or buy suitable sticky paper spots from a stationer.

Marking your slides prevents the embarrassment of showing them upside down; standardizing if possible on one type of slide mount reduces the necessity for refocusing to a minimum. If your slide projector has manual focusing you should stand by it throughout the show so that you can make minor adjustments whenever necessary. If your projector has remote controlled focusing and slide changing it is better to sit as near to the screen as possible so that you can monitor focus accurately.

A minor distraction that may prove difficult to eliminate is projector noise. The occasional mechanical rattling that occurs whenever a slide is changed is brief and not usually objectionable but the constant whirring of the projector cooling fan may be more obtrusive. Manufacturers try to make their projectors as quiet as possible, but if the noise bothers you or your audience you may be able to reduce it. If your home has a serving hatch between your kitchen and dining room, you can place the projector in the room and the screen in the other. A remote control handset can then allow you to join your audience and still work the projector.

There are a few other useful tips which can keep a slide show ran smoothly: remember to keep a spare projector bulb and a spare fuse somewhere in the house and make sure you know how to change bulbs quickly. A burnt out projector bulb can ruin an evening.

If all your slides are horizontal or vertical, their presentation can be improved by masking the edges of the projected image with black tape on the screen. Without the dust, bit white screen visible around the image contrasts less rather and better.

Showing the same slide for more than about half a minute can be boring and may lead to damage from overheating. Slides should not be left to cook in the projector gate.

Planning a show

Home slide shows are proverbially tedious. This need not be so. The main cause of audience boredom is over-enthusiasm on the part of the photographer: many photographers cannot resist the temptation to show every one of their holiday slides or every picture taken of the family in the past decade.

The primary rule for avoiding this type of error is to be ruthless with yourself, your pictures and to an extent, your audience. Evaluate your work very critically. A picture may have great personal importance for you and yet be completely without interest to anyone else. Even your best friends are apt to find a long series of pictures of your

Back projection

Back projection systems use a translucent screen instead of the usual reflective type. The image is projected onto the screen from behind, so that it is seen through the screen by transmission. To compensate for the lateral reversal of the image, the slides are oriented with their emulsion side facing away from the projection screen.

The main advantage of this system is that slides can be viewed in a normally lit room. For this reason back projection is popular with commercial and industrial users of slides, and many portable systems are sold. These often incorporate mirrors so that the projector beam is folded to give a compact screen and projector unit. The main disadvantage of back projection is that the screens are usually small, typically about the same size as that of a portable television, and the ideal viewing angle is narrow.

Setting up your own back projection system can be difficult, but it is useful for previewing slides and planning shows. The only item of special equipment that is needed is the screen. Commercial screens are usually made of plastic or glass, but tracing paper held in a suitable frame can also be used. Ground glass can also be used provided that the glass is only textured on the side facing the projector. A minor problem is that the image tends to be brighter at the centre than at the edges. This 'hot-spotting' can be remedied by partially obscuring the projector beam with a disc stuck to a sheet of glass; the size and distance from the projector of the disc can be found by experiment.

In sequence *By marking the edges of slides in a magazine you can quickly check that they are in the right order*

Corner spotting *Correct positioning is made easier by marking a corner of each slide, or snipping it off*

[illegible] wearying.

[illegible] your slides for technical errors such as [illegible] incorrect exposure or bad framing. Consider what you intend to say about each slide as it is shown. If you anticipate having to make excuses about any picture then you should not show it.

Finally, your slide show should have some coherent theme linking each picture. This is not always possible, and it can be overdone, but generally the interest of your audience in what you are showing is preserved if each slide builds on those that have been shown before and leads in a clear direction. For example, holiday pictures are much more bearable if the sequence of slides follows the rough chronological order of the holiday itself, if only the most interesting highlights of the holiday are shown, and if the pacing of the pictures makes it clear that there is an end in sight. Suddenly introducing 30 shots of a remarkably picturesque church you have found is likely to seriously discomfort your audience, but such a sequence might very well make an interesting slide show in its own right. It helps to make notes before you start, so that you can be sure of making any necessary comments and of sticking to the point instead of drifting off at a completely irrelevant tangent.

Finally, your slide show should leave your audience hungry for more. For this reason your show should be too short rather than too long: about 50 slides is plenty for one evening. Your audience may try to persuade you to show more pictures: resist the temptation. There is [illegible] not seen quite enough of your pictures [illegible] always be invited back.

Distorted picture *The projector should be level with the centre of the screen. Tilting it upwards causes 'keystoning'*

Systems SLRs

Choosing a full system SLR means that you can easily add new pieces of equipment to your camera outfit as your needs change or develop

courtesy of Olympus

When photographers talk about cameras, more often than not discussion revolves around one particular type—the 35 mm single lens reflex or SLR. The main reason for the popularity of the SLR lies in its great versatility. Most SLRs can be fitted with accessories of some kind or at least have provision for interchangeable features such as the lens. But a quick glance at a few manufacturers' catalogues shows that some SLRs are provided with a greater range of accessories than others. These are the system SLRs. Unfortunately for the camera buyer this can lead to problems in picking out the right system to suit your type of photography, can be extremely difficult. The sheer variety of equipment available is bewildering. So what are the advantages of a SLR system and how do you go about choosing one?

Choosing a system SLR

While all cameras are to some extent systemized, a true SLR system includes facilities for such accessories as motor drive, remote control, special flash units, changeable focusing screens and medical and research attachments. Some manufacturers, Nikon for example, try to produce as complete a system as possible while others produce accessories limited to particular fields of photography.

The problem of choosing lies in picking out a camera system which best suits your individual and overall needs of the moment as well as those which may arise in the future. This may involve choosing a cheaper camera and buying more system components than say a more expensive system containing fewer components.

One of the great advantages to the amateur of a system SLR is that you can begin by purchasing a body and say, a zoom, or wide angle lens and a motor drive and then gradually add to your system as your photography develops. A well chosen system SLR should enable you to cover in the best possible way the precise areas of photography that interest you most and yet be flexible enough to be adapted to other areas equally well without leaving you dissatisfied or feeling that you have to change systems to get the results you want.

System flexibility and price are generally related. At the lower end of the market are those cameras for which only a few lenses and other items are made. If you wish to use such cameras for specialized purposes, you have to use accessories made by independent manufacturers, an approach that may lead to unsatisfactory compromises.

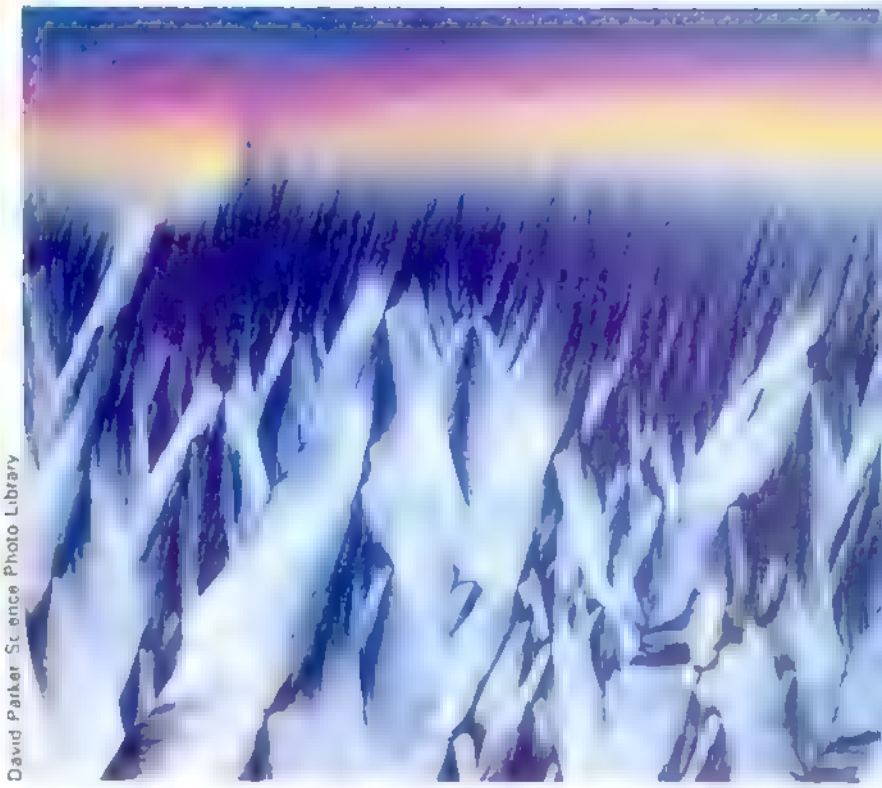
In the middle price range there is usually greater flexibility. Provision for adding a motor wind, dedicated electronic flash and other items are often included. Such middle range SLRs are generally made by the larger camera manufacturers and may be used with some of the accessories made by the same manufacturer and intended primarily for use with an advanced top-of-the-line model.

The most expensive cameras are sometimes called full system SLRs. The type was originated by the now discontinued Exacta which long had a reputation as being the doctor's camera. This was because it had a range of interchangeable viewing screens and prisms, special close-up and photomicrography accessories and a host of other items which medical researchers tend to need.

Modern full system SLRs continue the Exacta tradition. Cameras such as the Nikon F3, Canon F1, Pentax LX, Olympus OM-2 and others feature a range of accessories enabling the photographer to tackle virtually any task. With care it is possible to put together virtually a tailor made camera—Pentax for example even make a hand grip that the owner can carve to fit his or her own fingers. On a more practical level, being able to choose a different viewing system may make a considerable difference to your photography. For example, Nikon owners with imperfect vision and a taste for wide angle lenses would find a type P focusing screen invaluable since it incorporates not only split image and microprism focusing aids, but also cross hairs for aligning horizontal and vertical lines in the subject. Similarly Canon owners who often take low level shots could standardize on Canon's adjustable sports finder which allows either waist level or eye level viewing and exposure metering.

A full system SLR can usually be recognized by the degree to which it can be dismantled without tools. Removable backs, prisms, focusing screens,

Dave King equipment courtesy of Nikon



David Parker Science Photo Library

SLR systems *Olympus, Nikon and Canon produce the most extensive SLR systems. Olympus, shown here, have a complete range of lenses, alternative viewfinders and focusing screens and medical and astronomical attachments*

Nikon's system *includes bulk backs (below left) which can hold films of 250 or 750 exposures. The company also has a worldwide reputation for the versatility and robustness of their motor drive units (below)*

ports for fitting motor winds and sockets into which electronic accessories can be plugged are the distinguishing marks of a full system SLR. But what can be fitted to the camera varies from manufacturer to manufacturer.

System possibilities

Most of the accessories made for system SLRs are designed for professional users working in industrial or applied photography. This partially explains the high prices charged for advanced SLR system equipment. The market for specialized professional equipment is nowhere near as large as that for more basic amateur cameras and production runs are therefore much lower.

In one sense the knowledge that some of their cameras are likely to be chosen by professional users encourages manufacturers to produce items of equipment that can also be used by owners of amateur cameras. Most lenses from Olympus's range can be fitted to the amateur OM-10 camera just as all Canon lenses can be fitted to the Canon AV-1 yet it is unlikely that Olympus would

Absorbic acid magnified *The Olympus system offers the greatest range of photomicrographic accessories*

Dave King, equipment courtesy of Nikon

Fisheye lenses *and other system accessories can be fitted to the amateur's Olympus OM-10*

Dave King, equipment courtesy of Olympus

Dave King equipment courtesy of Minolta

Shift lenses *The problem of converging verticals can be eliminated with this f 2.8 from the Minolta system*

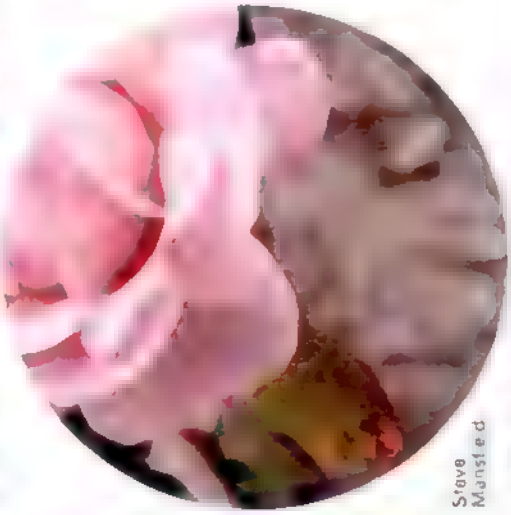
have produced their 8 mm f/2.8 fisheye lens, or Canon their 35 mm f/2.8 perspective control lens, if they only sold lenses to amateur photographers. So another sign of a system SLR is that its manufacturer also produces a wide range of lenses, some with very specialized purposes. While it is not essential to own a system SLR to make use of these lenses, in some cases it is a considerable help. For example, both extreme wide angle and extreme telephoto lenses are easier to use if you can fit a specialized focusing screen to your camera.

Two fields of photography that are more or less dominated by full system SLRs are those that involve photography by remote control, and those that involve photographing small subjects at high magnifications. Remote control photography includes specialized applications for such things as time lapse and surveillance photography.

The increasing popularity of simple motor winders among amateur photographers has led some manufacturers to produce non-system SLRs with remote control facilities. Often these sell at a lower price than the full system SLRs. For example, a non-system Chinon CE-4 with lens, motor winder and built in intervalometer (auto shutter release) costs less than the Nikon intervalometer alone. One reason for opting for the Nikon system rather than for a Chinon would be to take advantage of other items in the system, such as a 750 exposure film back or some specialized lens not available in the Pentax K-fitting used by Chinon.

Applications involving the use of high framing rates, interconnection of several cameras, special data recording other than a simple record of the time or date, remote control by radio or infrared and other functions virtually demand a system SLR. The range of such applications is broad and has led to specialization even within system SLRs. For example, although Nikon generally offer the broadest range of motor drive related accessories, along with the fastest motor drives in standard production, their products do not cover

On the record *Data backs are useful for recording the growth of your family or even the plants in your garden. Here, the date and time are shown*



Steve Mansfield

Dave King equipment courtesy of Olympus

Dave King/equipment courtesy of Pentax

every possibility in this field. Bulk production of audio visual presentations calls for extremely high accuracy of frame to frame registration, a need that is met by a special model camera made by Alpa, a relatively small manufacturer. System SLRs cannot do everything—they simply make it easier to achieve a wide range of purposes.

Close-up photography is another field in which one manufacturer is the leader. Olympus made microscopes before they began to produce the OM series of SLRs, and their SLR system reflects their expertise in this field. In addition to the usual system SLR close up accessories, such as bellows and extension tubes, Olympus also make special purpose light sources, short focus high magnification bellows lenses, and sophisticated microscope adaptors.

Because of their wide acceptance among professional photographers some system SLRs (notably Canon and Nikon) are given extra support by manufacturers and camera repairers. Both Canon and Nikon have been known to organize special repair facilities for their cameras at large public events such as the Olympics. And because of their wide international usage it is generally easy to have an F series Nikon or Canon repaired anywhere in the world should a fault develop. Another reason why it is easier to get full system SLRs repaired is because they generally remain in production much longer than SLRs designed for the amateur market. Full system SLRs made by Nikon, Canon and Olympus have average production on runs of about ten years, whereas amateur cameras may undergo major redesign every year or two. Camera repairers have plenty of time to get used to the peculiarities of full system SLRs.

Some independent manufacturers produce specialized accessories to meet needs not covered by the manufacturers of full system SLRs. The underwater housings and accessories made by firms such as Ikelite are an example. These devices are mostly produced for Nikon, Canon and Olympus system cameras. In the case of such specialized items the fact that they are produced by independent makers is not necessarily a disadvantage. Firms that concentrate on producing accessories for one special field such as underwater photography can concentrate on meeting the needs of underwater photographers more closely than camera makers with diverse product lines.

Dave King equipment courtesy of Olympus

***The Pentax system** includes a large range of eye- and waistlevel viewfinders, including one which rotates through 360° for use in either position. **Olympus's** telescopic autotube functions as a portable bellows for 'action macrophotography'. **Canon** produce the fastest 300 mm lens—the f/2.8. Though bulky, its speed gives it the edge over the Olympus f/4.5*

Which system ?

Your choice of 35 mm SLR system will depend upon the subjects that you want to photograph. This chart may help you make your selection

Subject	Accessories required	Systems manufacturers
Architecture	Shift lenses	**Canon**, Nikon, Olympus, Minolta, Pentax
	Ultra-wide angle lenses	**Nikon**, Pentax, Olympus, Canon
	Data backs	**Olympus**, Canon, Pentax, Nikon
Medical	Special lenses	**Nikon**, Olympus
	Ring flash	**Olympus**, Nikon
	Microscopic and endoscopic attachments	**Olympus** (extensive range), Minolta
Close-up work	Extension tubes	**Olympus**, Minolta, Nikon
	Bellows	**Nikon**, Olympus, Minolta
Action shots	Motor drives	**Nikon**, Pentax, Canon, Olympus
	Zoom lenses	**Canon**, Minolta, Pentax
	Fast lenses	**Canon**
	Follow focus lenses	**Leica**
	Interchangeable viewfinders	**Pentax**, Canon, Nikon
Wildlife	Long lenses	**Canon**, Leica, Nikon, Pentax
	Remote control	**Olympus**, Nikon, Canon, Leica
Repro copying	Copy stands	**Nikon**, Olympus, Minolta, Canon, Leica

Elisabeth Lenhard

Girl and fence *A deliberate choice of strident colours breaks the mood of introspection suggested by the pose*

Creative approach

Self portraits

When searching for subjects for portraits, why not look behind the camera? Self portraits give plenty of scope for the imagination and can be very revealing

There are many reasons why you may want to take a picture of yourself. You may need a portrait for a formal occasion or a passport for instance or you may want to put a figure into a setting when you have no model available. But probably the greatest motive for making a self portrait is that it is an ultimate form of self-expression.

Every photograph you take reveals something about yourself by your choice of subject and the way in which you interpret it. However, in taking a self portrait you have the advantage that you are both photographer and subject, thereby being in complete control of the final image. As such self portraiture represents one of the most challenging of all photographic themes, and one of the most gratifying. You will find, in making a self portrait that you will not only learn more about lighting, posing composition and focusing but you will also learn quite a bit about yourself. Many photographers, as well as classical artists have taken self portraits, and their efforts have a much more personal quality than any portrait made by another person.

There are many ways to take a self portrait, the easiest of them being merely to stand in front of a mirror with your camera while you take a picture of your reflection. You can add interest to this sort of picture by the clothes you are wearing and by taking care to include objects or a background which complement the self portrait. In taking a picture of your reflection you should be careful with focusing because the reflection actually appears as far behind the mirror as you are in front of it. You must focus on the reflection not the mirror itself. And you cannot use flash for such a picture as the flash will create so much glare that you will be almost invisible.

Using a mirror to make a self portrait is actually very helpful, as you are then able to practise expressions and poses before releasing the shutter. If you want

Linda Benedict-Jones

to use a mirror but do not want the camera in the picture, you should mount the camera on a tripod a short distance to one side of you, angled in such a way so as to have only your reflection in the final image but sufficiently close that you can still operate it. For focusing and composition either measure very carefully before you take your position or else use a target prop which you then replace with yourself.

There are many different ways to release the shutter in making a self-portrait. You can, if you are close enough, simply reach over to where the camera is mounted on a tripod and release the shutter by hand. You can also use the self-timer available on many cameras which gives you several seconds between releasing the shutter and taking your place as the subject. Alternatively there are extra-long shutter release cables available, working on the 'bulb' principle. For pictures taken over a greater distance the most convenient method is to use an electronic remote control, operated from a small handset.

If you use such methods to operate the shutter, you can place the camera some distance away, pointing directly at you without using the mirror to reflect the image. But it is useful to have a mirror close to the camera so that you can check your pose and the lighting before taking the picture.

Unless you use a mirror you will often need to create the picture completely in your mind before you begin. You will have to imagine the pose and expression you are going to adopt, and what effect you would like to finally achieve or what statement about yourself you would like to make.

As in all good pictures, a self-portrait to be effective should convey a strong feeling or idea. You should strive to express a certain mood or emotion in your picture. You are, in fact, interpreting yourself, so include your personality, your physique, your tastes, and your photographic style into the picture. It can be useful to select a background and poses that will convey something particular about your individuality.

A casual and interpretive self-portrait can be made by placing yourself in an environment that expresses something about yourself—perhaps in front of your home, in a favourite room, or outside, such as in a park or in a landscape. The objective is to try and say as much as you can by selecting either poses or backgrounds that will help you do this.

Syd Mason

Open door *The stark geometry of the room is contrasted with the human form.* **Edward Steichen** *The framing suggests a shy, tentative regard for the camera*

Hands before mirror *Careful framing to show only a part of the face and body, provokes the viewer's curiosity*

Edward Steichen, Galerie Bedon Lebon

Anne Conway

a tennis racket or a golf club. Many a lone sailor has recorded a [illegible] way by taking a self portrait at sea. In this case a necessity since no one else is around to release the shutter.

An entertaining source of self portraits is to photograph your reflection in a store-front window. In this way you record not only the reflection of yourself but also whatever is being displayed in the shop. In addition, you will record the activity in the street behind you.

Reflections that occur on water can also be used to make an interesting environmental self portrait. You can photograph your image in a puddle or

After lunch *Even the fine detail in this picture does not attempt to conceal the cable release, which reveals it as a clever self portrait*

Cecil Beaton

Wing mirror *An apparently casual self portrait, but in fact a carefully considered study which evokes a particular mood*

Props can also be used. You can photograph yourself by a window, reading a book or with a musical instrument or burying in your favourite chair. You can similarly pose with your car or your pet.

Many photographers take self portraits of themselves with their cameras signifying that photography is important to them or that they identify with it in some way. You can do this directly by aiming the camera straight into the mirror or by mounting the camera on a tripod and standing beside it. Or you could be more inventive and take a picture of yourself for example holding a lens to your eye, thereby conveying the 'I am a camera' idea.

Conceptual self portraits, which reveal a particular emotion or physical state, can be among the most challenging and interesting. You can convey 'oneliness', for example by posing on an empty road or in a vast landscape where there is little in the image but yourself or near an abandoned building or in a room empty of everything but yourself. If you wanted to make the statement that taking a self portrait is a self revelation you could make the most of this approach by taking a picture of yourself as a nude portraying an 'I totally reveal myself' idea. There are as many different concepts as there are people.

You might want to take a picture of yourself engaged in some sort of activity. For action self portraits using a self timer it is helpful to use a great depth of field so that you can be sure that you are in focus within a wide range. In addition it would help to use a wide angle lens relying on your ability to crop later, thus ensuring that all of yourself will be in the picture without the need to move too far from the camera. This way you can photograph yourself running, doing gymnastics, or swinging

André Kertesz

in a pond. By using water you can either avoid ripples, or use them for an unusual effect.

There are a variety of reflective surfaces out of doors, including the chrome on cars, door knobs, or even brass instruments.

Although at first the idea may seem very simple, using your shadow is one way of making an interesting and challenging self portrait. You can take a picture of your shadow on a road, against a building, or with a prop such as a bicycle or oddly shaped item that might add graphic or symbolic interest to the picture. Many possibilities exist in taking a picture of your shadow, as the time of day dramatically affects its size and shape, and you can choose the background and the time of day to add to the interpretation.

Self portraiture lends itself to such special effects techniques as double exposures, multiple images, sandwiches and montages. You can make all manner of interesting photographs using special effects techniques, following all the possibilities that are available with subject matter other than yourself. You can make an image where you appear to be inside a box, or in an unlikely location. You can use colour in a purely graphic way, with filters and the like, making multiple exposures of your silhouette. This approach is especially relevant if special techniques are a part of your photographic style. Another approach might be to photograph yourself with smoke from a cigarette or a cigar filling the frame, with soft blue whirls to create mood.

The lighting that you use in making a self portrait is important. If you are photographing indoors, the lighting is the same as that used for making any studio portrait, with side- or overhead bounced light being generally the most flattering. If you want an exaggeratedly dramatic picture of yourself, you can light your face from below, giving yourself a weird, eerie look.

Outdoor portraits are easier, as the brighter light means that you can stop the lens down for a greater depth of field, making focusing simpler. For harsh effects, use bright sunlight, which creates dark, sharp-edged shadows. They can make you look much older than you are, as they can make your face look as if it were hacked out of stone. For softer effects, a hazy sun, overcast weather or open shade will provide a diffuse light source that is the most flattering to human skin.

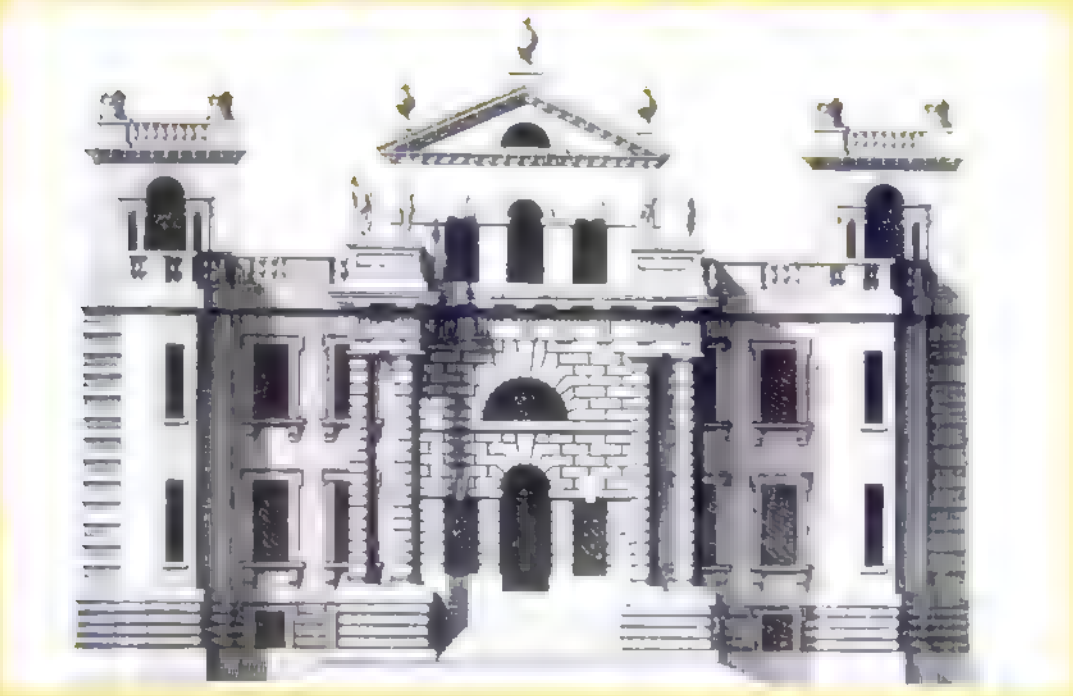
Remember that you do not have to take a frontal picture of yourself. You can photograph just a part of your body – your feet, your torso, your hands, an eye, or anything but your head. Isolate a part according to something you would possibly like to say, or just for the graphics or humour. You can, for instance, photograph your arms circling a tree, with your body hidden behind it, your legs sticking out from under a car, or your feet as through a fence. Other possibilities include photographing yourself from behind, perhaps sitting on a cliff overlooking an ocean, walking out of a door, or looking out of a window.

Multiple exposure *Here imaginatively used by Cecil Beaton to express the many sides of his personality.* **A shadow of himself** *by André Kertesz* **Shopping bag** *A deliberately unflattering expose*

Handsworth self portrait

Line and lith film

Normal b & w film records an image in various shades of grey, but high contrast line film and lith film give the pure black and white image needed for certain processes and effects



Mansell Collection

Contrast is an important feature of any photograph It can greatly affect the impression of sharpness, and give impact to an otherwise average shot. Control of contrast is, therefore, an important element of picture making. So *line* and *lith* films—which are black and white materials giving extremely high contrast—are useful for pictorial purposes, as well as more specialized technical applications

These films are often used to make high contrast images from normal negatives or transparencies, or in a large format copy camera, and are principally designed for technical use. For these reasons, they are normally available in the form of sheet film, varying in size between 9 × 12 cm and 24 × 30 cm, though 35 mm lith film is available in 30 m rolls

Line drawing *This is the type of subject for which line film is ideal*

Contrast range

The high contrast of these materials is clearly shown in their characteristic curves A low contrast film gives a gentle slope, showing a gradual variation in density from shadows to highlights A high contrast film, on the other hand, gives a very steep curve, with an abrupt transition from low to high density. In addition, a high contrast film shows wide extremes of density, from clear emulsion to almost complete opacity, while low contrast films usually have a small density range

The properties of line film are due to its emulsion, in which the silver bromide crystals are small but very uniform in size. All other factors being the same, grains of equal size require the same amount of exposure to make them developable When line film is exposed to a subject with a range of tones, only one of two things can happen. An area receives either sufficient exposure to make all the halide crystals developable, or too little for any of them to develop Ideally, the result is that the area comes out either as solid black and white but results normally contain a little grey. A normal emulsion has crystals of varying size so that in an area representing a mid tone, some of the larger, faster grains will become sufficiently well exposed, while others—the smaller slower ones—will not. After development, such an area will be neither clear nor opaque

Because of the smallness of the grain, line film is very slow. It is also usually either blue sensitive or orthochromatic (sensitive to blue and green), and so can be used with a safelight. As its name suggests, its chief use is for copying pen and ink

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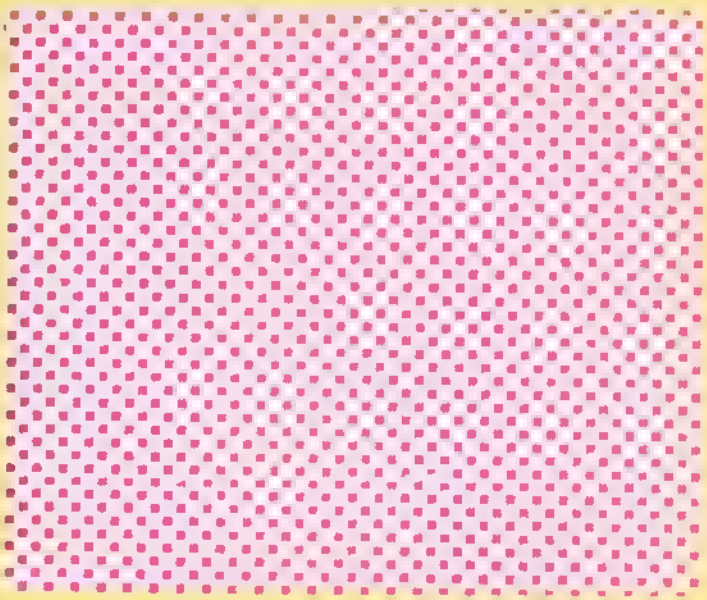


Lith film in printing *For reproduction in print, a b & w picture (1) is photographed on lith film through a dot screen (2) coloured for use with special contrast filters. Because of the high contrast of lith film, tones in the*

drawings, type matter and other originals for which the copies should have jet black lines on a snow white ground.

Lith films are very similar to line films, but give even higher contrast due to their very fine and even grain structure. Lith film is basically so slow that it is nearly always made orthochromatic, rather than just blue sensitive. This is so that its sensitivity to green light, as well as blue, prevents its speed being excessively slow. Even so, the speed of a typical ortho lith film is about 6 ASA (ISO) to tungsten light It is difficult to give an exact film speed, as this depends so much on exposure and development conditions — and the required result.

There is at least one blue sensitive lith film available for circumstances in which slowness is no drawback Its advantage is that it can be handled under brighter orange safelights, rather than the red lights required by ortho films

Lith films are most commonly used in graphic reproduction processes to produce half-tone and colour separation negatives (see page 1128). For the latter, panchromatic film is available, but this has to be handled in total darkness if freedom from fog is to be guaranteed.

In practice

Exposures with line and lith films are usually determined by testing—by using test strips, for example—an exposure meter does not generally give very reliable results, and because of the high contrast, exposure latitude is small

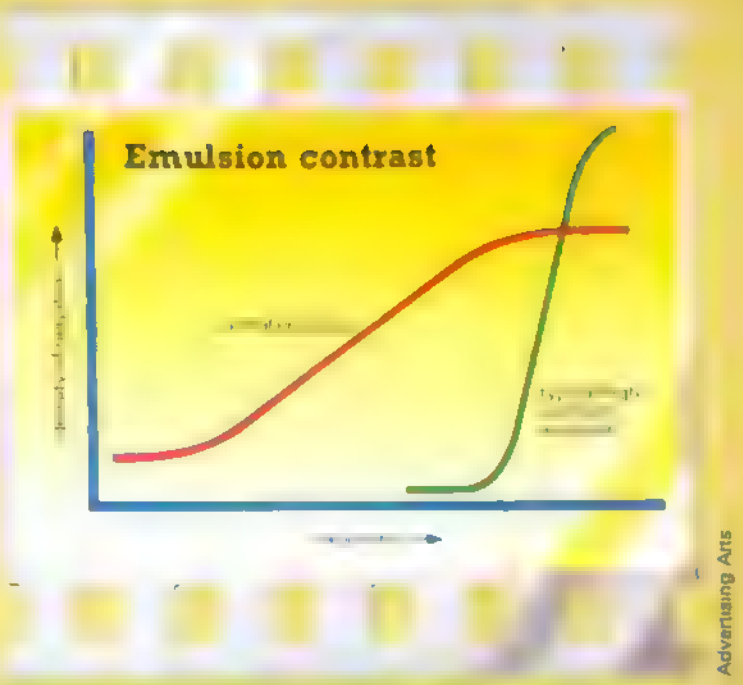
Development is also fairly critical. Special developers are used to enhance the contrast—for line film these contain hydroquinone as the sole developing agent, and a powerful alkali such as caustic soda. An ordinary printing paper developer can be used if less than the maximum contrast is acceptable. In fact, by using a soft working developer it is possible to make tolerably good negatives of ordinary multi-toned subjects, especially if they are of low contrast. But as a rule, normal developers are only used when the requirement is for high contrast with a few remaining tones

Similarly, a special developer is used with lith film. Like line film developer, it is a hydroquinone formulation, but it is so designed that it exploits what is called *infectious development* (see page 914).

In well exposed areas of the negative, those grains which have received sufficient exposure to be developable may be mixed with grains which are not quite sufficiently exposed (particularly at the edges of tones). Normally such an area would develop as a tone, rather than as complete black. But with infectious development, as development proceeds in the well exposed areas, accelerating compounds are released which encourage development of the less exposed grains. The dark parts of the negative thus become virtually opaque whereas the unexposed areas remained unaffected

One problem with infectious development—which in lith developers is caused by the inclusion of formaldehyde —is that it often leads to the blocking up of fine detail (such as fine black lines in the original) due to the spreading of the dark parts of the negative. For this reason, development with lith film is quite critical.

Another problem with developers for both line and lith films is that they are very active and are quickly exhausted by oxidation by the air above the solutions Their working lives, especially when used for dish development, are short, sometimes only a matter of minutes, although some proprietary lith developers remain usable (if not perfect) for a working day. Lith developers are normally stored as two stock solutions which, when separate, keep for some time. These are then mixed in equal proportions just prior to use. There are single solution caustic hydroquinone developers, but their storage lives tend to be short.



Advertising Arts

Characteristic curves *showing how different light intensities are recorded by normal and high contrast emulsions*

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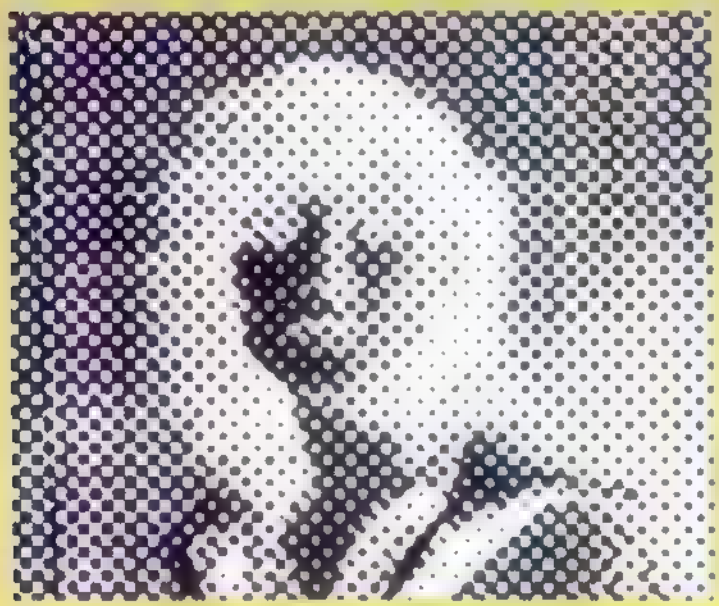

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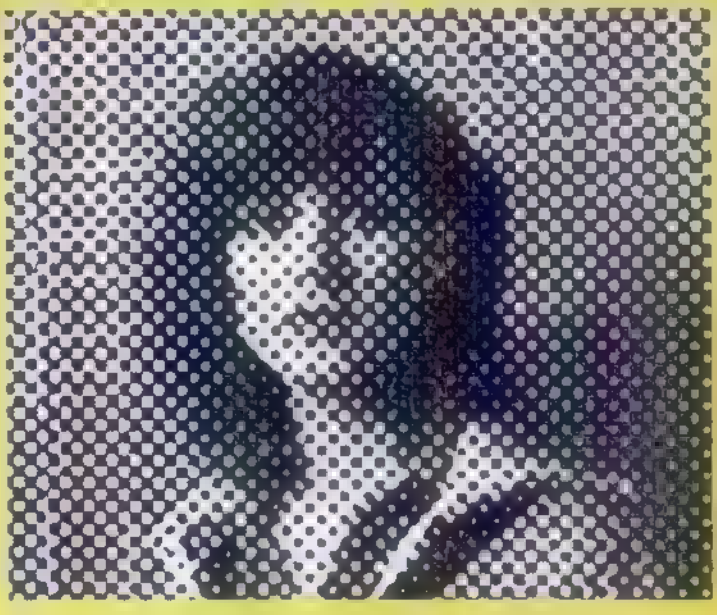

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original are recorded in the resulting 'half-tone' negative (3) as solid dots of different sizes. Before printing, this negative must be contact printed, again on lith film, to produce the half-tone positive (4)

World of photography

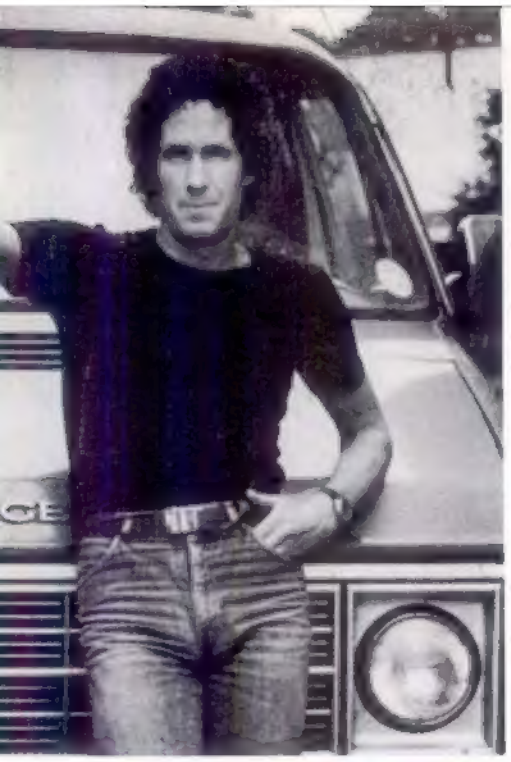
Ken Griffiths

Travelling with a camera that attracts a lot of attention can be a positive disadvantage, but Ken Griffiths has used it to create a unique personal style

Most photographers prefer to work quietly and unobtrusively when on location. Not Ken Griffiths. Wherever he sets up his Gandolfi stand camera he immediately becomes the centre of attention and every photograph seems to take on the air of a theatrical performance. People crowd round fascinated by the massive hand-built wooden camera, and excited by the idea that this curiosity of a bygone age, so unlike modern practice, is actually going to be used to take a picture.

Ken would not want it any other way. Because his camera is so conspicuous he could never shoot candid pictures of people and if they do not want to be photographed they can always walk away. To the man interested, don't look intimidating. People can say no and I leave them alone.

In fact people rarely do refuse and Ken often finds the excitement generated by the presence of his camera acts like a magnet. People start bending over backwards to help you because



Ken Griffiths

The open road *Late afternoon in Otago in the South Island of New Zealand. Taken for a photoessay on the country commissioned by the 'Sunday Times'*

Peasant woman *This stately woman was photographed in a small town in central Ecuador. Ken used a 150 mm lens and set the camera at f/16 for 1 second*

they want to see what's going on.

Naturally, Ken has become rather attached to the camera that provokes all this enthusiasm. The Gandolfi is, of course, a beautifully made camera and Ken has three of them—all hand-built from mahogany, with brass fittings and leather bellows. 'Having a Gandolfi is like having a friend—a wooden camera feels more personal somehow.' He rather enjoys the sympathetic reaction it provokes. 'People laugh, feel sorry for you, want to help you . . . "Poor chap, he can't afford anything else," they think.'

Of course, Ken does not only use a Gandolfi because it attracts so much attention: he also finds it a very workable camera, as it uses the large negatives —up to ten by eight inches—that he likes. Nevertheless, it is clear that a rapport with people is most important to his photographic style.

Like many professional photographers, Ken uses Polaroids to test composition and focus once he has set up the shot—black and white Polaroid rather than colour, because he feels colour is less reliable—but he values the Polaroids not only for the tests but because he can give them away.

'Polaroids are terrific. When you take a photograph of someone, they're doing you a favour—it's nice to be able to give them something in return on the spot. Polaroids also attract other people and they want to join in. This can lead to another picture. Polaroids are very important to me.'

Naturally, for a photographer who values this involvement with people,

location sessions are far more attractive to Ken than studio work. Indeed, unusually for a successful advertising photographer, Ken Griffiths does not have a studio at all. 'I started out with the idea that I did not want a studio and I never went out looking for studio work.' He was lucky in that once he had done a few successful location jobs independently, his career snowballed and people commissioned him to do the type of work he wanted to do.

'I think travelling is a big eye-opener. I don't like staying in one place for too long. I use the camera as an excuse to travel. One of the drives is to find out what makes other people tick. In fact, it takes about a week to organise a trip, and to get away. Now I know that I can leave the country very quickly if I need to. Of course you have to check out visas and what jabs to have. Every year I have all the jabs that I need, so I don't have to worry about that.'

Although Ken does not have his own studio, he seems to take an impressive array of equipment on location—his large Gandolfi cameras ensure that he can never move around lightly. When travelling around Europe, he takes a three tonne Dodge van filled with enough equipment to virtually build a studio on the spot.

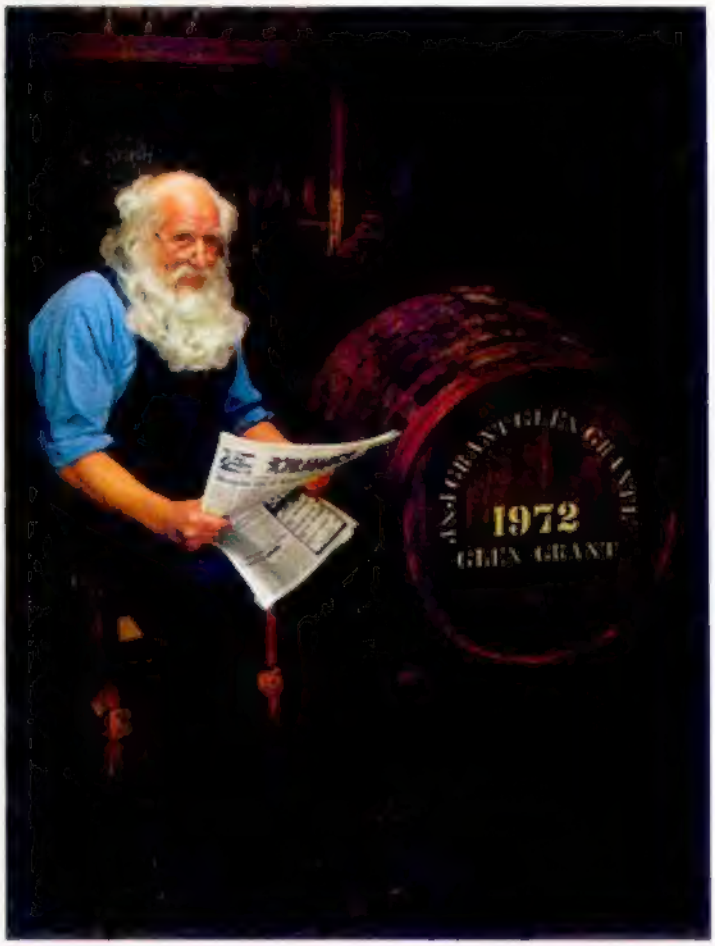
'I carry many studio lights—a Braun-color 6000 joule pack, two Linkron units of 4000 joules each, a boom, three or four different heads—poles to construct backdrops, a cover for me or reflectors, two or three different reflectors, along with lots of wires, leads, and metal foil. I can use the roof of my van as a platform if I need to. It's also high enough to look over hedges and things to get good views.'

Even for the long distance trips outside Europe he goes prepared with eight large cases of equipment. 'I have a tripod and a Gandolfi whole-plate camera which I mainly use with 5 × 4 film. I carry a 90 mm Super Angulon, 150 mm Schneider, 210 mm Schneider and a 480 Goertz lens with a Kodak shutter. I also take a couple of Gossen Lunar Six meters, a Minolta meter that gives flash readings and allows for mixing light sources, and a Minolta colour temperature meter. I've got about 60 double sheer film-holders—giving 120 photographs—and two boxes of filters. These include the Wratten 80, 81, 82, 85B series plus a whole range of greens, yellows, blues and reds—I use mostly tungsten balanced film and then convert for use with daylight and long exposures. I do a lot of shots where I'm mixing ambient light with flash, so colour correction and filtration can be quite complicated. I really prefer available light if I can get it, but I do carry a couple of Braun F910 flash packs for fill-in.' Ken is also unusual in that he can do his own camera repairs. He carries a lot of spare parts for his cameras and a tool kit so that he can deal with repairs on the spot. Of course, the range of equipment that he takes on assignments, depends upon

Ken Griffiths

American graffiti *Ken took a series of portraits of people with their cars, trucks and bikes for use in a new promotion for Kamasa, the specialist tool manufacturers. This is Dwight Scharli in Modesto, California*

Country life *The spectacular effect of ligh and shadow was caught in this shot of Ross in Westland, New Zealand while Ken was on assignment for the London 'Sunday Times.' Taken at ¼ second at f/22*



A bar in Naples *Shot as part of a story for the London 'Sunday Times' about the fading grandeur of some European cities. Ken found that the presence of his Gandolfi camera and the imaginative 'pidgin' Italian of his assistant Jean Luc Bernard helped to relax his subjects into natural poses*

Still life *A set up shot for the makers of Glen Grant whisky to emphasize the time malt whisky has to remain in the barrels. Ken used the people who worked at the distillery in Scotland as his models and lit the shot with a Brauncolor 6000 joule unit*

Ken Griffiths

Cane cutters of Tuxtapec *One of a series of atmospheric shots taken for a brochure about the Swedish firm SKF to show its international operations*

the brief he has been given.

Often the brief is fairly loose. For instance, for an advertising shot he did recently for Nike Sportswear, all he was told was that the picture must show a man running alone through an urban landscape after a heavy shower of rain. It was to be shot in England, but should look European rather than English, so anything identifiably English such as cars and street signs had to be kept out of the picture. He was given a rough sketch to work from, but this was not really very useful.

'The art director and I spent a while working this one out and eventually did the shot at Camden Lock in north London. We had this guy running along. But it was still dry, so we threw water on the pavement and fortunately it looked like rain. It was very dark and we had to set up our own lights. The final picture bore no relationship to the sketch, but it did have the same feel—dark and moody with the chap in isolation. In fact the advertisers liked it so much that they changed the whole ad. Now the copy reads. "Nike Sportswear, Camden Lock, London". I've done another shot for that campaign in Paris and I've now been given two more to do elsewhere.

Other briefs are much more tightly structured, typical of these is an advertizing assignment he did for Heineken lager. The brief was to show a tanker with Heineken lager written on the side parked in front of the Leaning Tower of Pisa in Italy in three ten by eight shots that joined together to give a complete panorama of the scene.

Unusually, Ken Griffiths combines advertizing photography with a considerable reputation for magazine work. His earliest editorial work was for the British *Daily Telegraph* in 1971—a trip to Russia that he set up and planned himself. 'We had a lot of trouble at a couple of points—most of my pictures were confiscated by the KGB. I was held by them for a couple of days and I lost all the colour film that I had, but I managed to keep shooting enough material to do a story that was eventually used.'

More recently, he has been working for the *Sunday Times* magazine for whom he did his first major assignment back in 1977. 'I'd been here eight years and I wanted to go back to New Zealand where I was born. The picture editor at the time, suggested I go back and "do some landscapes" for them—that was the brief.' I set up the flight and they covered my other expenses, though having a letter from the magazine was very useful.' His editorial experience can often be immensely useful for his advertising work. Several years ago he did a series of portraits for a Bayer Chemicals campaign. 'We had to find several different situations which showed Bayer working well. It was very much a *Sunday Times* type idea. It had to almost look like a *Sunday Times* picture spread.'

On one recent assignment, for the Swedish firm SKF Bearings, Ken travelled for nearly two months with an art director and a writer. 'It involved going to different countries where SKF Bearings had their offices, and doing something related to the people that would illustrate a story about SKF and how good they are. So in Mexico it was workers cutting sugar-cane. In Brazil it was a train pulling iron-ore out of the jungle. It was more to do with illustrating the country through an interesting picture than it was about photographing bearings.'

Although he has managed to develop a very personal style through both his advertising and editorial assignments, Ken realizes the shortcomings and limitations of doing only professional work. 'I've got to pursue some of my own ideas, otherwise I'll end up a vegetable. Luckily, I haven't got so many commitments—I haven't got any staff. Now I'm changing my direction a little more. I've seen a number of things in this world and I feel I should do something about it—like the destruction of Brazilian tribes in the Amazon, the wiping out of trees in Ecuador, the treatment of deprived and tribal people.'

He has a number of personal projects in mind and one is particularly close to his heart. 'The next job I do for myself is going to be just me and a stand camera, photographing the aborigines in Australia.